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USSR REPORT
ENERGY

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OIL AND GAS

ORENBURG OIL CHIEF NAMES RECENT FEATS, NEXT GOALS, PROBLEMS

Moscow NEFTYANIK in Russian No 7, Jul 86 pp 2-3

[Article by R. A. Khramov, General director of the Orenburgneft Association: "Much Work Is to Be Done"]

[Text] Orenburg Oblast's oil industry is approaching its 50th anniversary, and in 1984 it recovered its 200-millionth ton of oil since the start of development of the oblast's fields.

The true establishment of Orenburg's oil industry occurred during the preceding three five-year plan periods, when the Buzuluk and the Sorochinsk oil regions were created, and now still another region--the South Orenburg--is being created. The maximum level of crude and condensate recovery were achieved during the 10th Five-Year Plan. It consisted of more than 13 million tons per year.

The collective of blue-collar workers, engineers, technicians and white-collar workers of the Order of Labor Red Banner Production Association Orenburgneft met its 11th Five-Year Plan goal ahead of schedule--on 10 December 1985. By the end of the year 276,000 tons of crude and gas condensate and 79 million cubic meters of gas had been recovered above the plan. During the five-year plan labor productivity rose 1.3 percent above the plan, and all above-plan crude was obtained through increased labor productivity.

During the precongress labor drive, the collectives of the Buzulukneft Oil and Gas Recovery Administration, the central production services base for the repair and rental of submersible electrical installations, the plugging office, and more than 60 brigades fulfilled their five-year plan tasks ahead of time.

Specific labor expenditure of industrial-production personnel per oil well was greatly reduced. While in 1980 there were 3.016 people per well, in 1985 there were 2.27 (a reduction of more than 27 percent).

During the 11th Five-Year Plan, 408 measures for new equipment and progressive technology were introduced, resulting in an economic benefit in the amount of 30 million rubles.

The association paid the most earnest attention to raising the role of laboring collectives in solving production tasks, energizing the human factor and

raising the responsibility of each worker for the state of affairs at the production facility. Almost 60 percent of blue-collar workers are covered by the brigade form for organizing work, and 130 brigades are operating under the brigade-contract method, under which wages depend upon obtaining a final product. The method of integrated servicing of wells is being used widely.

The potential for introducing oilfields and deposits with large and medium-sized oil reserves in the oblast was exhausted at the end of the 10th Five-Year Plan, and the numerous small fields could not support specific growth in the amounts of crude recovered.

Right now Orenburgneft' is recovering oil at 63 fields. Thirty fields are under industrial development, 33 are in trial operation, and drilling is under way at 14 fields.

All the fields that are being developed are marked by a high degree of withdrawal of reserves: for most of the fields, the withdrawal of reserves was almost 50 percent, but for individual fields it was 80 percent or more.

The structure of the reserves carried on the association's books has changed. For 15 years the share of hard-to-get oil reserves in the overall inventory rose from 8.4 to 40.8 percent. The hard-to-get oil reserves are associated with multiple-formation strata that are complicated by inhomogeneous, low-head, and cavernous fractured collectors and with deposits that include gas and water-and-oil zones and contain highly viscous crude.

All this led to the absolute value of reduction in oil recovery reaching 16.7 percent.

The main task has been set for Orenburg's oilfield workers: to reduce in the next few years the rate of drop in oil recovery by greatly building up production capacity, improving the system for developing oilfields, and improving the quality indicators for operation of the active well inventory.

The reduction in oil recovery can be reduced and, moreover, its volume built up only where explored resources that are substantial in size are put into operation.

The main directions for geological exploration during the 12th Five-Year Plan, as in the preceding years, remains the Mukhanovo-Yerokhovo depression, the East Orenburg structural projection, and the southern submergence of the Buzuluk basin.

As has already been noted, a large number of the oblast's fields and deposits have entered the late stage of development, which is marked by a reduction in oil recovery and increase in water invasion. Under these circumstances, measures for increasing total oil withdrawal from formations, segregating multiple-formation targets, singling out formations of complicated structure as independent targets for development, and drilling a reserve inventory of wells in undepeleted and poorly drained areas have become urgent.

During the 12th Five-Year Plan the association is to:

increase the amount of work on the segregation of formations of complicated structure as independent targets for development, and select drilling-solution formulas that avert degradation of the permeability of the productive horizons;

strengthen systems for waterflooding by creating additional centers, increasing the injection pressure, and converting to a stricter area methodology for developing productive deposits;

change the kinematics of fluid flows; and

densify the well grids and convert to the construction of wells with open bottom holes.

The association continued to work to improve well-inventory utilization and oil-recovery technology.

Wells make up the main amount (65 percent) of the productive capital of the association's oil-recovery enterprises. At present, wells at oilfield targets number 2,600, including 2,075 operating wells. The long-range plan calls for growth in operational drilling and for the introduction of new areas, fields and deposits. This will lead to an increase in the inventory of recovery wells of 3,000 by the year 1990. During the 11th Five-Year Plan, it was planned, and it still is planned, to change the structure of the well inventory in regard to methods of operation. Moreover, the number of low-flow wells will increase. By 1990 total water invasion of the output recovered will grow to 90 percent.

Aging of the wells poses the problem of increasing the capacity of and improving the technology for well overhaul. The association is to construct a department for repairing and coating pump and compressor pipe, to rebuild oilfield power-supply systems, to put the conversion to chemical processes for removing salt and paraffin during oil recovery on a higher scientific and organizational basis, and to increase the treatment repeatedly of the bottom-hole area with a view to increasing the wells' productivity.

There is a great potential for reducing the labor intensiveness of a well by introducing widely a new type of equipment for operating wells--a long-running deep-well pumping installation (DGU) with a belt-traction unit. The replacement of the traditional pumping jacks by these installations will enable the operating time between repair of wells to be increased because of the great durability of the belt-traction action, repair expenditures connected with replacing the deep pump to be reduced, the efficiency index to be raised, and power consumption to be reduced. During the 12th Five-Year Plan it is planned to equip 50 wells with DGU's.

Undertaking oil and condensate recovery from deeplying deposits in the new regions in the oblast's southwest poses for oilfield workers technical problems connected with the recovery of high-paraffin oils and with the operation of wells where the gas factors are 500 cubic meters per ton of oil and higher. Already now scientific research is proceeding full blast with a view to selecting the most effective measures for operating wells with atypical crudes. Among them are such methods as stimulation of the formation's

bottom hole, such as heat treatment of the well face during the recovery of viscous crudes, foam-acid treatments, treatment with various solvents, and so on.

The problem of raising the reliability of pipelines within oilfields is becoming increasingly severe. The association is to expand the scale of use of anticorrosion coatings for inner pipeline surfaces and of corrosion inhibitors.

During the 12th Five-Year Plan the association's drillers are to drill 3.34 million meters of rock and to complete the construction of more than 1,000 wells. In so doing, average well depth for operational drilling will increase 4 percent, for exploratory wells 11.4 percent. In the zone near the Caspian, where well depths are 4,600-5,000 meters and geological conditions are complex, complicated well designs are required, but drilling volume will grow from 85,000 meters in 1985 to 280,000 meters in 1990.

Work on technical reequipping and on improving the technology for sinking wells will be continued, and drilling with the use of screw-type downhole motors and low-rpm turbodrills will increase 2-fold to 3-fold. A new D1-240 downhole motor will undergo industrial testing. Means for controlling the operating modes for destroying rock and for operating the ION-Iskra type drilling tool will find wide application. Their use will enable penetration per bit and mechanical speed to be increased by 12-14 percent. Even now the association is testing a new BU-2500EP installation with thyristor control and based on DC.

Capital construction will be further developed. The amounts of production and nonproduction construction will be increased to 170 million rubles per year, including 40 million rubles for construction and installing work. Great amounts of capital construction (about 100 million rubles) are to be mastered in connection with introduction of the Kamelik-Chagan group of fields, to the south of the Buzuluk basin, into operation. Substantial resources will be aimed at making use of casing-head gas, at automation, at the electric-power supply and at road construction.

The association will also henceforth build up oilfield facilities on an integrated basis, taking into account creation of an infrastructure that fully provides oilfield workers with housing and facilities for social, cultural and domestic services in each region. In order to provide support for the newly created capacity, especially for drilling, the introduction of housing must increase from 15,000 to 40,000 m^2 per year.

The economy of production is directly dependent upon the physical amounts of production and its indicators and problems. The association increased the rate of growth of the prime cost of producing output under the heading "amortization." Under these circumstances, a buildup in oil recovery volume and a saving of resources require a sharp rise in the level of productive, technical and economics work by all the association's collectives.

Thanks to the introduction of measures for raising labor productivity, it is planned to reduce specific manpower expenditure per well by 15 percent by 1990 and to release 860 workers provisionally.

The use of remote control systems at the association's enterprises, with the release of tending personnel, will be expanded, remote control of well clusters will be introduced widely, the coefficient of the measurement of well flow, based upon an increase in the efficiency of ganged measuring installations, will be increased, work on the fully instrumented reporting of liquid being recovered will be completed in all recovery brigades, and terminal microprocessing equipment will be introduced.

Special attention will be paid to restructuring the style and methods of supervision and to raising the role of the human factor in solving tasks that have been set. Measures already are being taken for a reduction in reporting and correspondence, for ready acceptance directly at workplaces of decisions by responsible association staff workers who visit on mission assignments, and for increasing the self-reliance, the initiative and the responsibility of each worker.

The question of reorganizing the administrative staffs of the association and its enterprises and production units on the basis of the Belorussian railroaders' initiative is being studied.

During the first 4 months of this year the association recovered 13,100 tons of crude and gas condensate and 2.9 million cubic meters of gas and realized 400,000 rubles' worth of output above the plan. These results yield a foundation for considering that the association's collective, guided by the historic decisions of the 27th CPSU Congress, is coping successfully with the assigned task of reducing the rate of drop off and at stabilizing the recovery of crude oil.

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CSO: 1822/312

OIL AND GAS

TASS: OIL INDUSTRY MINISTER ON PRODUCTION PROSPECTS

LD061405 Moscow TASS International Service in Russian 0603 GMT 6 Sep 86

[Text] Moscow, 6 Sep (TASS)--After a lengthy decline, oil recovery in the Soviet Union has started to grow again, Vasiliy Dinkov, the minister for the industry, told a TASS correspondent. He was being interviewed on the eve of oil and gas industry workers' day, which falls on Sunday.

Over the first 8 months of this year, the industry fulfilled the pelan for oil supplies to the national economy and for export, Vasiliy Dinkov added.

He recalled that in the last 20 years the recovery of oil, together with gas condensate, went up 2 and 1/2 times. This increase was achieved mainly through the development of new deposits. Western Siberia remains the country's main source of oil. It provides almost two-thirds of the liquid fuel and will retain its supremacy in this for a long time to come. In the next 5 years oil production in Western Siberia will be steeply increased. It will also increase in Kazakhstan, despite the fact that work there is taking place in difficult desert conditions. Aside from that, it is intended to start developing deposits in Archangel oblast. In the remaining regions, recovery will be conducted at a stable level.

In the current 5-year plan period the industry intends to begin developing 215 new deposits, including 77 in Western Siberia. All this makes for a real opportunity to increase the recovery of oil, together with gas condensate. to roughly 635 million metric tons [per year] by 1990.

As far as natural gas is concerned, the minister said, in the last decade production in the USSR has gone up almost 2 and 1/2 times, standing at 643 billion cu m last year. The industry is already developing at an accelerated pace. In the last 8 months, 450 billion cu m of gas has been recovered--almost 30 billion cu m more than in the same period last year. And it is intended to take production to 850 billion cu m by 1990. To this end, deposits in Western Siberia are being developed at an accelerated pace. Practically the entire growth in gas recovery will be provided by the deposits at Yamburg, situated inside the Arctic Circle.

Fuel from there will be transported by pipelines. To achieve this, almost 50,000 km of gas pipelines need to be laid over 5 years. The USSR will retain its leading position in the world both for the rate of constructing them, and for their length and throughput capacity.

/9274
CSO: 1822/004

OIL AND GAS

USSR OIL INDUSTRY PERFORMANCE REVIEWED

PM031509 Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 17 Sep 86 p 3

[SOCSIALISTICHESKAYA INDUSTRIYA "Heavy Industry Section" report: "Operating According To Plan. The Oil Fields in August"]

[Text] The last month of summer was a crucial one in the work of the country's oilmen. As our paper has reported, after lagging behind for a long time, the sector has achieved the plan level for daily oil extraction. And at the beginning of September, on the eve of their professional holiday, the workers of the Main Administration for Petroleum and Gas in the Tyumen Region (Glavtyumenneftegaz) also reached the target.

Here is a summary of the plan fulfillment by leading Petroleum Industry Ministry components in August:

Glavtyumenneftegaz	99.2
Nizhnevartivsjbeftegaz	102.0
Yuganskneftegaz	101.2
Surgutneftegaz	104.0
Noyabrskneftegaz	98.4
Krasnoleninskneftegaz	101.8
Varyegganneftegaz	83.6
Tatneft	98.2
Bashneft	100.9
Komineft	105.2
Mangyshlakneft	101.0
Kuybyshevneft	101.2
Tomskneft	102.1
Permneft	100.8
Udmurtneft	100.0
Orenburgneft	101.5
Grozneft	103.9
Ukrneft	102.2

In the ministry as a whole daily extraction in August increased by 4,600 metric tons. But the shortfall which built up at the beginning of the month was not made up. It was not until the early days of September that the oilmen finally started operating normally. Now they are extracting more than 3,000 metric tons of oil and gas condensate per day in excess of the plan.

The accelerated commissioning of fresh stocks, above all in West Siberia, played a decisive part in the breakthrough. With the active support of people in allied sectors, the Gyumen workers fulfilled their tough annual program for developing fields in 8 months. Although the output of each of the fields is relatively low--there are no "second Samotlors" among them, unfortunately. But the substantial extension of the extraction front has made it possible to ease the situation at fields which have been exploited for many years now and stabilize the situation in the region as a whole.

Use of extraction capacities has markedly improved at fields in the Tyumen North. Whereas on 1 January nearly 3,000 wells were standing idle in excess of the norm, the number has now been more than halved. The repair teams sent from many of the country's oil areas to the aid of the Siberians are returning home. This is a good sign: The emergency can be said to be over. But there is still a long way to go before everything is completely fine. Before the end of the year over 1,000 inactive holes have to be recovered, most of them needing complex repairs.

The Surgut field workers have again distinguished themselves, having extracted a further 18,000 metric tons of liquid fuel. There is no doubt that they will honorably keep their pledge to raise the above-plan score to one million. Oilmen in the republic of Komi, in Tomsk Oblast, and in the Siberian branch of "Bashneft" are stepping up the tempo. The oil producers of Groznyy and Krasnodar, Stavropol and the Ukraine are skillfully exploiting the reserves of oil fields. The collective of the very big Nizhnevartovsk association reduced their debt to the state by nearly 250,000 extra metric tons in August.

There have been changes for the better in the laggard "Varyegan neftegaz" association. For a long time, because of serious engineering and geological errors, the oilmen totally failed to find the key to the intricately structured local deposits. Only now that the scheme for maintaining reservoir pressure has essentially been revised once again and the amount of water pumped into the reservoir has been increased by one-third has the situation been rectified. The inactive wells have been revived. Oil extraction increased by 2,600 metric tons per day at the fields in the Varyegan group in one month.

The drilling workers had a good August, boring 132,000 meters of rock in excess of the plan. But they are sometimes having to put the break on because of poor material and technical supplies. In 8 months enterprises of the USSR Ministry of Ferrous Metallurgy have failed to supply the oilmen with more than 60,000 metric tons of casing and drill pipes. Often one observes the following picture. A leading team drills a well in 4-5 days, fighting for economies every minute. Then it is idle for a week, waiting for a casing string.

Preparations for the winter are in full swing at oil fields. Last winter fronts, snowstorms, and snow drifts did a lot of damage to equipment left out in the open. So this year preparatory work started in good time, back in early spring. In the sector as a whole overhauling of Vputnik group testers, burying of oil pipelines and waste pipes, and heating of group pumping stations and injection wells are ahead of schedule.

At the same time, in a number of northern areas where, one might say, winter is on the doorstep, work is behind schedule. The relevant sector headquarters services are basically confining themselves to gathering data and are not taking prompt and effective steps to eliminate bottlenecks. At a recent session of the Petroleum Industry Ministry Party Committee Communists who are central apparatus leaders were given a strict warning about their personal responsibility for the state of affairs in what is today a particularly important area.

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COAL

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SOVIET, FOREIGN MINERAL RESOURCE CLASSIFICATIONS COMPARED

Moscow RAZVEDKA I OKHRANA NEDR in Russian No 3, Mar 86 pp 17-20

[Article by M. V. Shumilin (USSR Mingeo [Ministry of Geology]): "Comparison of Soviet and Foreign Classifications of Mineral Resources"]

[Text] In 1981 the USSR Council of Ministers approved a new "Classification of Reserves of Mineral Deposits and Predicted Resources," which established common principles for estimating and government accounting of reserves of mineral resources in conformity with the degree to which they have been investigated and their national economic importance. The following are the main features that distinguish the new classification from the one in existence up to 1981: adding to the four categories of reserve three categories of predicted resources; enabling the full or partial use of the C_2 category of reserves together with high-category reserves when projecting reserves; more precisely defining requirements for the investigation of various categories of reserves and the specifications for the preparedness of deposits for commercial development.

Since the 1970s there has been a sharp increase in worldwide attention to estimating reserves of mineral resources and to global analysis of the status of the base of various types of minerals, and therefore an increased interest in problems of resource classification. Since the early 1970s the classification of the U. S. Bureau of Mineral Resources and Geological Service has been reviewed and updated, and elements of it have been widely used in estimating the resources of various capitalist countries. The classification in effect in Canada is similar to it. Somewhat different are the classifications adopted in France and the FRG [2 and 5]. At a special UN conference in 1979 a draft was reviewed of an international classification of mineral resources, which had been prepared by the Center for Natural Resources for Power and Transportation of UN headquarters [7]. The classification in effect in our country up to 1981 has been used with some changes by a number of CEMA countries.

There are therefore a number of classifications of mineral resources in the world, which are constructed on general principles of comparative certainty and commercial importance, but which differ in the number and designations (indexing) of the categories, and in the traditions of use that have developed. The first studies especially devoted to comparing existing

classifications appeared in the late 1970s [9 and 10]. They compared the American system of classification with that operating in the CEMA countries [9], and also the American system and the modification of it adopted in Canada with the classification employed in MAGATE [International Atomic Energy Agency] international surveys of uranium. The absence of the Soviet classification from the comparisons limited the value of these studies.

In their report to the 27th International Geological Congress a group of Soviet scientists compared virtually all the prevalent classifications applicable to coal [5]. Since their main purpose was an overall analysis of coal resources, the authors did not give any special attention to analyzing the comparison itself. They observed that reserves classified abroad under a single high category may correspond in Soviet practice to the sum of reserves of the three categories $A+B+C_1$. N. P. Laverov, A. O. Smilkstyn, and the author of the present article came to the same conclusion by comparing various classifications of reserves when analyzing the worldwide raw material base of uranium [4]. However, in that study the authors' goal was not a comparative analysis of the various classifications. Royle's article [8] reviews a number of classifications, including those in Western Europe. However, his analysis was not accompanied by a sufficiently formal comparison. Before proceeding to this analysis, it is necessary to briefly describe a few foreign classifications. In the American system of classification resources of mineral raw materials are divided into two main groups, according to the degree to which they are known: "identified" [ustanovlennyye or vyyavlennyye] (an unequivocal translation of foreign terms is not always possible), and "undiscovered" [neotkrytyye, neobnaruzhennyye, nevyavlennyye]. The first group refers to resources connected with known fields (deposits), and the second to assumptions based on various geological and geophysical information. Identified resources (the term "reserves" [zapasy] is also used) are divided into three categories: "measured" [izmerennyye] (sometimes also called "proved" [dokazannyye]), "indicated" or "probable" [ischislennyye or veroyatnyye], and "inferred" or "possible" [predpolagayemyye or vozmozhnyye]. Reserves of the first two categories can be taken together as the subgroup "demonstrated" [podtverzhdennyye]. The term "reasonably assured" [obosnovanno garantirovannyye] is also applied to them.

Measured reserves are those estimated in geometrized contours of ore bodies based on samples taken from wells or mine drifts, and occurring in a regular and sufficiently dense network. It is thought that the possible error of estimating the quantity of these reserves does not exceed ±20 percent. Indicated reserves are determined on the basis of a limited number of samples and extrapolation based on geophysics. It is assumed that the sampling network is not dense or homogeneous enough for direct mapping of the ore bodies.

Inferred reserves are estimated mainly on geological or geophysical grounds, or from single samples.

In accordance with the definitions given, only the highest category -- measured reserves -- is estimated within geometrized contours built up from the data of a regular prospecting network. All the remaining categories are established to a greater or lesser degree on the basis of geological data.

Therefore, for geologically complex occurrences of non-ferrous and rare metals and other raw materials, which we define as members of Group III of formation complexity, the category of measured reserves must be taken in practice as corresponding to Category C_1, and measured reserves as a whole must be taken as corresponding to the sum of Categories $A+B+C_1$ of our classification. As noted above, the authors of the study cited on coal came to the same conclusion [5].

The French classification of reserves has been described in a study by E. Karle [2]. In accordance with this data reserves of mineral resources are divided into to five groups: reserves, resources, prospects, local predictions, and regional predictions. The first two groups include reserves of explored fields of varying degrees of exploration and readiness for extraction. Reserves of the "prospects" group are estimated within a contour of extrapolation based on geophysics, adjacent to a contour of higher-group reserves. It is specified that only for resources of the "reserves" group can the probable error of estimate be calculated; for "reserves" it is conventionally taken as ±50 percent, and for "prospects" as ±100 percent. Reserves of the "predictions" group correspond to geophysical estimates of the resources of sectors with known criteria of mineralization (local predictions) or large-scale territories with favorable geological grounds (regional predictions).

As far as one can judge from the data provided, resources of the "reserves" group most closely correspond to the sum of reserves of categories $A+B+C_1$ in deposits that have been explored in detail or exploited. The "resources" group corresponds to C_1 reserves of preliminarily evaluated deposits and to C_2 reserves of explored deposits, the "prospects" group corresponds to P_1 resources of explored deposits and to C_2 resources of preliminarily evaluated deposits, and the "predictions" group corresponds to P_1 and P_2 (local) or P_3 (regional). The French classification emphasizes the importance of the degree to which a subject has been studied. Blocks of reserves explored by a single network may apparently be regarded as a higher or lower group according to whether a deposit has been exploited, and whether it has been explored in detail or only preliminarily, but there is no hard and fast rule for the stages of geological exploration work.

The classification proposed by the UN for international use is distinguished by extreme simplicity, since it constitutes a fundamental plan for subdividing resources [7]. Its purpose is to make possible a global analysis of mineral resources, and this simplification is therefore appropriate. This classification provides for a division of only three categories, designated R-1, R-2, and R-3. Category R-1 includes the reserves of explored deposits that have been studied and evaluated with great certainty, although for some types of deposits the error for determining their quantity may reach 50 percent. Category R-2 includes the resources of known deposits that have been preliminarily evaluated mainly on the basis of geophysical concepts confirmed by determining the parameters at specified points. The error of estimation may exceed 50 percent. Category R-3 includes the resources of deposits not yet discovered. The evaluation of resources of this category is based on the geological interpretation of geophysical and geochemical data, and on statistical analogy. Under the Soviet classification Category R-1 corresponds to the

$A+B+C_1+C_2$ reserves of deposits explored in detail, Category R-2 to the C_2 reserves of preliminarily evaluated deposits and the P_1 resources of any deposits, and Category R-3 to P_2 and P_3 resources.

The total number of categories of the degree to which reserves have been studied is smaller in the foreign classifications [3-5] than in the Soviet classification [7], and the reduction is due to fewer subdivisions of reserves that have been extensively studied. Where, in our classification, depending on the formation complexity group of a deposit, explored reserves consist of summing up the four categories $A+B+(C_1$ and $B)+C_1$, or C_1+C_2, abroad these reserves are regarded as the sum of the maximum of two categories: measured+inferred reserves+resources. For deposits allotted by us to Groups III and IV, reserves defined as measured apparently correspond to the sum of Categories C_1+C_2. The number of categories of explored reserves in the first versions of our classification that were adopted in 1941 and 1953 was still greater, and was gradually reduced by combining the B_1 and B_2 categories into a single Category B, and later, the A_1 and A_2 categories into a single Category A. It should be noted that for purposes of state accounting, the division of explored reserves into a large number of categories is completely inappropriate, since the reserves of Categories A+B, and form many mineral resources, Categories B+C as well, are added together in the balances. Technical-economic planning activities are also based on the sum of Categories $A+B+C_1$, and for Group IV, Category C_2 also. It is considered feasible to obtain Categories A and B by exploring an adequate range of deposits. When the reserves are confirmed, it often happens that the deposits are transferred to a higher complexity group, and their reserves to a lower (C_2) category, but the reverse does not occur.

In the actual application of a classification, use of the higher categories is limited, and Category C is the main category of explored reserves. The requirements applied to the degree to which reserves of this category are studied have recently been gradually tightened up. The main purpose of the categories of explored reserves in our existing classification is to establish the degree of readiness of deposits for development, as determined by observance of the prescribed correlation $A:B:C_1$; and $B:C_1$ or $C_1:C_2$, depending on the complexity group of the deposit. The proportion of higher-category reserves in the first two cases is relatively small, and the more highly explored part of the deposit plays the role of an experimental sector, in which the morphology and the mining-technical conditions for developing the ore bodies are studied in detail. This detailed work is required as a rule in deposits for which the division of high-category reserves is not considered feasible, so that reserves of several different degrees of exploration are treated as a single C_1 category. This demonstrates that requirements for readiness for development can be established even without introducing special higher categories into the classification. The different activities for studying the morphology of ore accumulations from the standpoint of mining technology are the main criteria for differentiating the first three categories of our classification [1 and 3]. In the foreign classifications reviewed this criterion is virtually unused. Categories of reserves appear in them only as indicators [taksony] that differentiate the certainty of the quantitative estimates of the resources. It is clear, however, that for reserves that

belong to a higher category ("measured", etc.) problems of mining technology are studied abroad in the detail necessary for a reliable estimate of the economic value of a deposit and of the maximum production cost of extraction.

Comparison of Soviet and foreign classification systems thus reveals a substantial difference in their ultimate purpose. The Soviet classification serves a dual function, both playing the role of an accounting system for resources and a system to evaluate the degree of readiness of deposits for development. The foreign classifications are mainly systems of accounting for resources. Over many years there has been no letup in Soviet literature in the discussion of the feasibility and desirability of setting up a quantitative measure of the certainty and accuracy of estimating resources belonging to various categories. The prevalent negative point of view on this issue is most fully grounded in the study of I. D. Kogan [3]. Advocates for the adoption of such measures often rely on foreign experience. As shown above, the criterion of the accuracy of categories in foreign classifications is more often a qualitative than a quantitative indicator. It only emphasizes the difference among reserves that have been reliably explored (i.e., the sum of $A+B+C_1$ of our classification) and those preliminarily evaluated (C_2). Presumably, the certainty of the first could be estimated quantitatively, but that would not be possible for the second. It should be kept in mind that the issue of the reliability of estimates of reserves comes up in connection with the task of accounting for them, while the adoption of Categories A, B, and C_1 in our classification essentially serves the purpose of evaluating the degree of readiness for development of the deposits, and their quantity is accounted for by adding the categories together. Therefore, it is clearly not appropriate to set up different criteria of accuracy for these categories.

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12697
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COAL

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USSR COAL MINISTER ON NEW EQUIPMENT NEEDS

Moscow UGOL in Russian No 8, Aug 86 pp 6-11

[Article by M.I. Shchadov, USSR Minister of the Coal Industry: "Science--in the Service of Production"]

[Text] The strategy for accelerating the country's social-economic development, worked out by the historic 27th CPSU Congress, specifies reconstructing the national economy on the basis of the newest achievements in science and technology, reorganizing the economic mechanism and administrative systems, using the reserves of the economic system and intensifying the role of the human factor.

Putting into action the course adopted by the party made it possible, in the brief period after the congress, to achieve some improvement in the work of the coal industry. For the first time, during the last few years, there was success not only in stopping the reduction in coal extraction volumes but also in ensuring a noticeable rise in this indicator, as well as in improving the financial-economic activity of the sector. This was the result, primarily, of efficient use of the achievements of scientific-technical progress--introducing complexes of a new technical level at the mines, mining equipment with great unit capacity and highly productive, continuous operation equipment at the open pits, means of mechanization in the mine-preparation work and advanced coal extraction technology, as well as raising labor and production discipline and developing the workers' initiative and interest in the results of their work. All this attests to the presence in the sector of large unutilized reserves which can and should be put into action. One of the main directions toward improving the quantitative and qualitative indicators of work in the coal industry is accelerating scientific-technical progress and increasing labor productivity on this basis. The USSR coal industry has at its disposal a sufficient scientific-technical potential, a broad network of scientific research and planning and design institutes, a modern experimental base and skilled personnel forces of specialists to solve the problems posed for it by the 27th CPSU Congress.

Work is continuing on strengthening relations between sectorial science and production and developing the experimental base and test production at scientific research and planning and design institutes, primarily the leading ones.

In the 11th Five-Year Plan, scientific research, planning and design, and planning-research institutes made a number of major developments in the sphere of creating new equipment and advanced industrial procedures.

Expanding the sphere of use of a non-transport system of mining with interior dumping, and introducing efficient technology for shooting the strip rock, partially moving it to a space already worked by the energy of the blast, have contributed to a further development in open coal extraction.

New models of open-pit-excavators having buckets with a capacity of from 5 to 20 m^3 have been developed. To suit the conditions of the Kansk-Achinsk basin, continuous-action machine complexes have been created for stripping and for extraction, having rotor excavators with a productivity of 5250 m^3/hr and increased cutting force. For Kuzbass conditions, a crusher-conveyer set of equipment has been developed, having a productivity of 4000 m^3/hr, to do the stripping in accordance with cyclical-flow technology.

In order to ensure the efficient work of the new excavator equipment at the open pits, highly productive means of railroad and motor vehicle transport are used, including powerful pulling units with a coupling weight up to 372 tons, eight-axle cars with a carrying capacity of 145 tons and open-pit dump trucks with a carrying capacity of 170 tons. A system of technical operation of open-pit dump trucks with a particularly large carrying capacity has been developed and put into operation.

A series of work on improving the mine management of the shafts, technology and means of complete mechanization and automation of the breaking and mine preparation work and a rise in the level of labor safety for the miners has been carried out for the underground method of coal extraction.

Standard systems for opening up and preparing new levels, as well as general systems for cutting the mine takes in the main basin, the use of which ensures elimination of the gradation of underground transport, reduction in the capital-intensiveness of constructing new levels and a saving in operational expenditures have been developed and approved.

Advanced technological systems for working the coal beds, including those that have a danger of blow-out, are being widely introduced. The stopes operating according to these systems have load and labor productivity indicators higher than average for the sector.

Complete mechanization of the breaking face work at the sloping beds average in thickness has been mainly completed, sets of equipment on a new technological level for the thin beds--1KM-103 and KD-80, for steep beds--the ANSHCH unit have been developed and are being introduced. The highly productive KRT, 4PP-2M and 1GPKS tunneling combines, the 4PP-2SHCH combines to carry out work along the blow-out-dangerous beds and the Sibir and Soyuz-19Y complexes and MPK loading machine with side unloading of the bucket have shown to advantage.

New, more efficient methods of degasification to combat methane at extracting sections with a high load at the longwall have been developed. In 1985, degasification was used at 225 mines, and comprehensive methods of degasification were introduced at 40 mines, making possible a 1.3-1.5-fold rise in work efficiency. New instruments for telemetric monitoring of the mine atmosphere (the Metan complex) are in operation.

Introducing completed scientific-research developments ensured a rise in the technical level of production in the sector. The relative significance of the open method of coal extraction was increased to 42%, and 47.2% of the coal is extracted at the open pits by rotor excavators, and by using the non-transport system, 390 m^3 of rock were processed. The portion of coal extraction using the pillarless technique of working the beds at the mines rose to 67%, the level of complete mechanization of the breaking work--to 73.1% and of the combine method of drifting--to 42.1%.

Work was done in mine construction directed toward accelerating scientific-technical progress and toward raising the technical level of construction, which made it possible to increase labor productivity by 9.4%. The relative significance of full-unit construction rose--in 1985 it was 31.6% as against 25.2% in 1980. Efficient volume-planning and structural designs are used in the construction of buildings and structures, as are light metal structures with complete sets of supplies.

The vertical mine shafts are constructed in accordance with advanced technology, using mobile drifting equipment and shaft-tunneling combines of the SK-1 type from TsNIIpodzemmash [Central Scientific Research and Planning and Design Institute of Tunneling Machines and Complexes for the Coal Mining Industry and Underground Construction]. This contributes to raising the labor productivity of the drifters and increasing the speed and volume of tunneling the shafts. The rates of capital investment utilization and of carrying out the construction and installation work rose respectively by 30 and 19%.

The results achieved in scientific-technical progress, however, could not compensate for the adverse effect of the mining-geological and mining-technical conditions in working the coal deposits becoming more complicated and did not ensure a noticeable rise in the qualitative and quantitative indicators of the sector's work.

The scientific-research, planning and design and planning and research organizations and the all-union and production associations and administrators of the USSR Ministry of the Coal Industry and the UkSSR Ministry of the Coal Industry do not pay proper attention to concentrating the scientific-technical potential on solving the most important problems of developing the coal industry. There are considerable unutilized reserves for purposeful strengthening of the relations of sectorial science and production. The plans of the institutes are overloaded with insufficiently topical and short-sighted subjects, the scientific-technical level of the research and development is rising slowly, and there is practically no reduction in the periods for designing

new equipment. At some institutes, machinebuilding plants, in the production and all-union associations and at the enterprises and organizations of the USSR Ministry of the Coal Industry, executive discipline is still low in the planning and carrying out of research, developments and solutions to the problems of organizing the introduction of their results and coordinating NIOKR [scientific research and experimental design work] plans with those for production and capital construction. The order existing in the sector for planning and financing NIOKR is characterized by a multistage nature and by the centralization of the adoption of practically all the administrative decisions in this sphere, which leads to considerable outlays of labor and time for the development and coordination of NIOKR plans, diverting the workers of the ministry's central staff from solving long-term problems.

The shortcomings noted in the work of sectorial science were one of the important reasons for the reduction of coal extraction volumes in the last few years, and for the deterioration in the qualitative and quantitative indicators for work in the mines and at the open pits. The labor productivity per worker with respect to coal extraction for the USSR Ministry of the Coal Industry in 1985 was only 65.4 tons/month, and the level of manual labor at the mines--47.5% and at the open pits--35.3%.

Because of the unsatisfactory solution to a number of important scientific-technical problems, late development of machines and equipment of the new generation and for other reasons, the technical level of construction in the sector does not fully meet the goals set for the construction workers by the 27th CPSU Congress. In recent years, in construction, the growth rates of labor productivity have dropped, and the periods for construction of new coal enterprises and the modernization and technical reequipment of existing ones have been shortened hardly at all, which holds back the rates of scientific-technical progress in the sector. Over half the mines have not been reconstructed, which has led to obsolescence of the mine resources, the appearance of "narrow" links in the technological chain and a low level of production capacity development.

Open pit work is characterized by long periods of creating and developing new equipment with a large unit capacity, inadequate supply of powerful mining and transport equipment at the open pit mines, lack of provision with repair bases and spare parts and a low level mechanization for the auxiliary processes. In a number of cases domestic excavators, with respect to structural designs, are on a par with the best foreign models, but their weight indicators need to be improved, the electrical equipment used in them has insufficient specific power, the commutating apparatus is sensitive to vibrations and is badly adapted to work under low-temperature conditions. The drilling rigs turned out, although corresponding in their parameters and technical productivity to analogous foreign models, need greater reliability and comfort. The unsatisfactory state of the roads, particularly where large-load dump trucks are used, has a substantial effect on the work of motor vehicle transport.

Problems, particularly pressing for the underground method of extraction, of developing the technology and devices for minimal-manpower extraction of coal and complete mechanization for thin, steep and thick beds, have not been solved, and technological solutions on protecting the drifts at great depths, and on leaving rock in the mine have not been worked out.

The plans for the mines and open pit mines often specify labor-intensive, material-intensive solutions, not technologically feasible. Insufficiently efficient structures, materials and items continue to be used in considerable volumes, and this does not meet today's requirements for scientific-technical progress.

As a result, the relative proportion of manual workers is being slowly reduced. For example, in the break faces, even with the use of machines of a technically new level, the proportion of manual labor is 47.5%, and in mine construction--50%. New machines with a negligible increase in productivity are twice as expensive as the models replaced, and their reliability level is insufficient.

The resolutions of the April and October (1985) plenums of the CPSU Central Committee and the documents adopted by the 27th CPSU Congress require considerable restructuring of sectorial science, with a view to increasing its efficiency, maximum drawing toward production, intensification of responsibility for the technical level of coal extraction and processing enterprises and construction and coal machinebuilding. These resolutions orient the coal industry toward advancing development of the open pit extraction method. The entire planned growth of coal extraction in the 12th Five-Year Plan is to be obtained through this method.

The sector's scientific collectives are faced with a responsible task--to form, on the basis of the latest achievements in fundamental and applied sciences, a base for creating a new generation of technical devices and advanced technological solutions for open working of coal deposits. The strategy for directing scientific-technical progress at the open pit mines should be aimed at seeking new solutions in developing technical devices and technical processes, as well as at efficient use of the scientific-technical potential amassed.

In the sphere of preparing the rock mass for excavation, work should be continued on developing and introducing drilling rigs for directed drilling of blast holes up to 400 mm in diameter to a depth of up to 60 M. More attention should be paid to improving and developing new types of drilling equipment, including bore hole expanders. Work on monitoring the action of the blast, both when crushing the rock and with the blast movement of the strip pit rock into the worked-out space is an important direction in research. Developing special means of blasting to put into effect multipoint initiation of the charge must also be accelerated, and will make it possible to increase the reliability and quality of the blast preparation of the rock mass for highly productive operation of the excavation and transport equipment.

A key direction is expanding the scale of using highly efficient non-transport and transport-dumping systems for mining. With a view to this, research must be carried out and engineering measures must be implemented to increase the stability of interior dumps located on foundations with angles of incline up to 20°, and a new generation of dragline-excavators with buckets having a capacity of 20, 40 and 65 m^3 and booms up to 125 M long must be designed and introduced. A transport system for mining using new models of open-pit excavators with buckets having a capacity of 10, 15, 20 and 30 m^3 will also be further developed, as well as their modifications designed for varying mining conditions. Acceleration of the manufacture and supply of excavating equipment is outlined, in order that the mining equipment parks be maximally provided with new models, including highly productive hydraulic excavators having buckets with a capacity of 8, 12 and 20 m^3, and in the future--up to 40 m^3.

The development and widescale introduction of continuous action equipment and efficient technological systems for stripping and extracting work at the open-pit mines of the Ekibastuz, Kansk-Achinsk and other basins are quite an important direction in the sphere of advanced flow technology for mining. At the same time, the efficient use of rotor complexes with a productivity of 5250 m^3/hr should be ensured, and in the future--up to 12,500 m^3/hr. These include rotor excavators and among them, those with top loading, and interbench reloaders, conveyers and spreaders. Expanding the scale of using flow technology and continuous action equipment under the inclement climate conditions of Siberia and Eastern Kazakhstan is a direction new in principle in the acceleration of scientific-technical progress.

Open-pit transport is an important link in the technological chain at the open-pit mines. Its improvement and further development should follow the path of expanding the sphere of use of towing units, alternating and direct current, with a coupling weight of 360 and 372 tons, which has no analogy in foreign practice. The development and widescale introduction of dump cars with an increased carrying capacity--145 and 170 tons--are specified to ensure the optimum combination of excavators and open-pit transport means. There will be considerable development of motor vehicle transport at the open-pit mines through introducing domestic dump trucks and coal carriers with a carrying capacity of 110, 120 and 170 tons.

Development and introduction of conveyer (truck) trains, which combine the advantages of conveyer and railroad forms of transport are an effective direction. Given the technical reequipment of open-pit coal mines with the basic forms of open-pit equipment, more attention should also be paid to the mechanization of auxiliary work, in particular, rail, blast and repair.

In the 12th Five-Year Plan, along with outstripping development of open-pit mining, great significance will be attached to accelerating scientific-technical progress at shaft mines, which provide extraction of an overwhelming part of the most valuable grades of coal (coking, anthracite). Scientific research work in this sphere must concentrate on solving the problem of a fundamental improvement in the shaft mine resources and in mine management, of a rise in the technical level of the basic technological processes, reducing labor intensiveness and substantially reducing the amount of manual labor used and improving the conditions and labor safety of the work.

Regenerating the shaft mine resources is at present a key problem, determining the strategy for developing the sector's production potential. Along with the major modern mines in a number of basins, particularly the Donets, there are still small enterprises with quite low technical-economic indicators. Many mines, constructed and reconstructed during the last 15 years, are not making full use of production capacities and as a result, underproduce a considerable amount of coal. Sectorial science should evaluate the state of the mine resources and determine the most effective directions for its development in the next few years and in the future in general in each basin, on the basis of comprehensive accounting of all the influencing factors and requirements of the USSR Energy Program.

Improving the state of the shaft mine resources is indissolubly bound with raising the technical level of mining. The primary task is to eliminate lagging behind in work on breaking and preparing new levels at a number of mines in the main basins. At present the number of mines requiring the construction of new levels has reached 170, including 101 mines in the Donets, 31 in the Kuznetsk, 16 in the Karaganda and 7 in the Pechorsk basins. Practical experience shows that the traditional methods of stripping mine fields that require permanent capital work to be done on the construction of new levels are quite imperfect, and under the conditions of intensive working of the deposits lead to considerable difficulties entailed in the reproduction of the stripped coal reserves. Therefore, developing methods new in principle to strip the mine fields, eliminating the need to construct new levels as the mining work goes deeper, is an important task. This will ensure conditions for stable operation of the mine throughout the entire period of its service and for reduction in capital-intensive work on maintaining the capacities and operational expenses.

DonUGI [Donets Scientific Research Institute of Coal], the IGD [Mining Institute] imeni A.A. Skochinskiy, ShakhtNIUI [Shakhty Scientific Research, Planning and Design Institute of Coal] and Dongiprouglemash should concentrate their efforts above all on developing the technology and means of complete mechanization of extraction of thin and very thin beds. At the same time, the development of planing extraction is a promising direction.

An important task of DonUGI, IGD imeni A.A. Skochinskiy and Dongiprouglemash is the development, perfection and introduction of technology for extraction from steep beds. For conditions of the Central area of the Donbass, technology must be developed for completely mechanized working of the beds with long posts instead of the low-efficiency, labor-intensive and hazardous extraction of coal using jack hammers with a continuous working system. Development of an automated unit with conveyer-post extraction without constant supervision in the stope, and of a KShCh panel complex, the use of which will make it possible to lower the level of manual labor at the breakage face, should be completed in very short time, as should the development of technology for extraction from beds up to 0.7 M thick, using a robotized complex.

Sectorial science is greatly indebted to the miners of Prokopyevsko-Kiselevskiy Rayon in the Kuzbass, where the technology for extraction from

thick steep beds, created as far back as prewar and wartime years, still predominates. The transition to hydraulic methods of extraction from the beds, primarily thick ones, and the use of various types of filling must be placed as the basis of the technical policy for this rayon. In the 12th Five-Year Plan, KNIUI [Kuznetsk Scientific Research Institute of Coal], IGD imeni A.A. Skochinskiy and the Kuzbassugol All-Union Production Association should complete the development, perfection and introduction of effective technology and means of complete mechanization for these beds:

Horizontal strata in descending order with extraction by narrow strips along the course with a KGSZ type complex and the use of solidifying filling;

Sloping strata along the course with a set of AKZ equipment and solidifying filling;

Automated complexes ensuring the load at the breakage face up to 3000 t/day must be developed for gently sloping seams 0.8-5M thick. By the end of the 12th Five-Year Plan, the development should be completed and the industrial perfection of these complexes should be begun. Full equipment of the breaking faces with complexes of the new technical level will make it possible to release 35-40,000 manual laborers.

In the 12th Five-Year Plan more attention should be paid to scientific research and planning and design work on creating the technology and means for extracting coal at the beds with complicated mining-geological conditions without constant supervision at the stope and to improving the technology for hydraulic coal mining, particularly in the Kuzbass. A solution to the problem of reducing the amounts of rock issuing from the mines, its utilization and increase in coal extraction with a filler of the worked-out space should be accelerated.

The task of developing the technology and equipment for extraction from beds subject to gasodynamic phenomena in the entire range of mining-geological conditions, as well as those with weak side rock is socially important and urgent for production. This problem should be solved by methods new in principle. Instead of working out expensive measures of a restrictive nature, as has been done up to now, as a rule leading to an increase in labor intensiveness and a deterioration in the technical-economic indicators for coal extraction, the efforts of the scientists should be directed toward developing more efficient and safe technology, not dependent on the influence of complicating factors.

In the 12th Five-Year Plan the institutes in the sector should carry out scientific research and planning and design studies on improving mining equipment and technology. Tunneling combines at a new technical level, which make it possible to break up a solid mass efficiently in coal-rock faces with precutting (up to 75-80%) of the side rock should be developed. These combines should have smaller dimensions and a two-speed work mode. The possibility of using mounted equipment, interchangeable drill bits eliminating the need to scrape the soil off manually and means of automatic control and diagnostic elements must be specified for them. A multi-purpose

machine systems must be created--a cutting-extracting complex, ensuring the presence of open-pit furnaces and cutting workings along the coal beds in a broad course.

The problems of a fundamental improvement in capital construction and a rise in the technical and organizational level of the entire construction complex and a substantial reduction in the investment cycle must be solved.

VNIIOMShS [All-Union Scientific Research Institute for the Organization and Mechanization of Mine Construction], KuzNIIshakhtostroy [Kuznetsk Scientific Research Institute of Mine Construction, TsNIIpodzemmash [Central Scientific Research Institute of Underground Machines], the planning institutes, construction organizations and enterprises of the sector should:

Accelerate the performance of scientific research in the sphere of mine construction, implement widescale introduction of completed developments, improve the planning decisions and ensure the unification and standardization of buildings and structures of surface mines, open-pit mines and concentration mills;

Raise the stage of plant readiness of the building structures and items and perfect production and the use of advanced building and chemical polymer materials, as well as economical types of rolled metal;

Develop and perfect series output of new types of mine tunneling equipment to drive and deepen the shafts, of large-diameter wells and of sloping and horizontal mine workings, as well as well as means of small-scale mechanization.

Increasing the reliability and service life of mining equipment (breakage and tunneling combines, conveyers, props), development and introduction of methods and means of diagnostic monitoring and use of new materials and methods to strengthen the metal structures and elements of mechanical transmissions are important tasks for sectorial science. In connection with this, there must be an improvement in the technology of coal machine building and instrument making. The scientific research of VNIIPTuglemash [All-Union Scientific Research, Planning and Technological Institute of Coal Machinery] and DonPKTI [Donets Planning and Design Technological Institute] should be directed toward:

Increasing the precision of machining base members of the drives for combines and reduction gears for flight conveyers and the degree of precision for gears on the basis of using machining centers with ChPU [digital program control], machine tools to grind the teeth and slots of heavily loaded gears and advanced methods of thermal and chemico-thermal machining;

Creating flexible production systems and new methods of protecting working surfaces, such as ion nitriding, chemical nickel plating, perfecting the production of a module hydraulic apparatus method of high-temperature soldering in a vacuum;

Raising the quality of the welded structures of mechanized props by using steel with greater strength, semi-automatic and automatic welding and methods of nondestructive control;

Increasing the strength of the scrapers for one- and two-chain conveyers on the basis of using completely mechanized stamping lines;

Raising the quality and above all, the precision of stamped and cast blanks through using advanced technology and automated engineering equipment;

Increasing the service life of GShO [mining equipment] parts on the basis of widescale use of methods of surface machining through plasma spraying and hard-facing and of improving the quality of electroplated and chemical protective layers, etc.

The scientific research carried out by IGD imeni A.A. Skochinskiy, MakNII [Makeyevka Scientific Research Institute for Work Safety in the Mining Industry] and VostNII [Eastern Scientific Research Institute of Work Safety in Mining] on averting sudden blow-outs, improving degasification methods, combating dust and developing the newest systems of comprehensive monitoring of the state of the mine atmosphere should be activated. Basic attention should be paid to developing regional methods of averting sudden blow-outs and of degasification of the beds, the use of which will make it possible to prepare excavation poles in advance for safe working. With respect to combating dust, the main efforts should be concentrated on seeking solutions new in principle, since in intensifying coal extraction at the shaft-mines and open-pit mines, the methods traditionally used to suppress dust do not ensure the necessary reduction in the dust content of the air.

A system of state testing of the most important types of breaking, tunneling, drilling and transport equipment will be introduced in the sector in the 12th Five-Year Plan. Their purpose will be to evaluate objectively and reliably its correspondence with the existing demands, to ensure thorough verification of the technical level and quality, to avoid having technically and technologically imperfect, structurally unfinished products put into production and to monitor the stability of the quality of the items in the process of their series production and operation.

The leading organization for state testing--IGD imeni A.A. Skochinskiy--in conjunction with the base testing organizations and plant manufacturers of equipment--must, in as brief a time as possible, ensure testing by programs and methodologies, as well as by advanced means of carrying them out.

Putting into effect the measures outlined to raise the technical level of the underground method of extraction and construction will make it possible, in 1990, to release over 16,000 workers engaged in heavy manual labor, to raise the level of coal extraction from completely mechanized breakage faces to 78-80% and the volume of using the combine method of working to 48-50%, to stabilize, by 1990, the labor productivity per worker at the mines, and then to achieve an increase in it, to ensure, in the 12th Five-Year Plan, the

growth of the volumes of construction and installation work, mainly through an increase in labor productivity in construction, and to shorten the periods for coal industry construction projects, bringing them up to the norm.

Along with carrying out technical reequipment in the sector, the management mechanism must be fundamentally reorganized. Sectorial science should create scientific bases ensuring a transition to economical administrative methods. New methods of management, which, beginning in 1987, will be used in the coal industry, must be worked out with great care. Above all, measures making possible a substantial rise in the soundness and balance of the planning goals and improving the system of indicators and economic norms should be drawn up. The efficiency of introducing new management conditions depends on solving these problems. The relation of wages and other material incentives with the results of labor should be strengthened. Efficient ways must be found to deepen cost accounting and the transition in the final analysis to the ability of all the associations and enterprises to pay their own way.

The solution, facing sectorial science in the 12th Five-Year Plan, to the complex tasks of accelerating scientific-technical progress and increasing labor productivity requires a reorganization of administration in science, an improvement in the system of planning scientific research and experimental design work, strengthening of the relations between science and production and a radical change in the organization of introducing the results of the completed scientific developments.

The planning of scientific-technical progress must be carried out on the basis of target program principles. The plans for solving the most important problems of the sector should be formed within the framework of the sectorial scientific-technical programs.

For purposeful strengthening of the relations between sectorial science and production, there must be a transition to systematic development, in the main basins, of scientific production associations fulfilling the role of complete scientific-technical centers, while maintaining the large specialized institutes along the most important directions in the development of mining science and technology. It is also expedient to examine the question of creating scientific-technical and engineering-introductory centers on the basis of a number of production associations, with the participation of the leading and basin institutes, planning and design organizations and machine building plants.

The existing organization of NIOKR planning and financing should be changed. Implementation of the functions of forming, coordinating, confirming and financing the NIOKR of the sectorial plan in the indicated spheres of production and types of activity must be entrusted to the leading institutes, answerable for acceleration of scientific-technical progress in the subsectors of the coal industry (extraction of coal and shale by the underground and open-pit method, concentration and processing of the coal and shale, capital construction, coal machine building and instrument making) and the basic directions of activity (economics and administration, geological

prospecting work and mine surveying, nature conservation, etc.). In this way the role, significance and responsibility of the leading institutes for the development and fulfillment of scientifically based plans for work on the development, perfection and introduction of new equipment projects, as well as for efficient expenditure of the financial resources allotted for these purposes, will increase. In addition, it will be considerably easier to organize the planning and financing of NIOKR for the sectorial plan.

A solution by sectorial science to the problems of accelerating scientific-technical progress will provide the conditions for successful fulfillment by the coal industry of the assignments of the 27th CPSU Congress to increase the coal extraction volumes, raise the qualitative indicators of the sector's work and improve conditions and labor safety practices for the miners.

12151
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NON-NUCLEAR POWER

TASS: 'ENERGY CHAIN' ON VOLGA NEARING COMPLETION

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[Text] Leningrad, 6 Oct (TASS)--The formation of an energy chain is being completed in the basin of the Volga River, Europe's biggest.

Leningrad engineers have assembled the last power generating units on the hydro-power stations near the City of Cheboksary in the middle reaches of the Volga and in the lower reaches of the Kama River, Volga's biggest tributary. The aggregate generating capacity of the Cheboksary and Nizhnekamskiy hydro-power plant will top two and a half million kilowatt.

The construction of hydro-power plants on the Volga was started in the thirties with the construction of the Ivankovo power plant with a generating capacity of 30 thousand kilowatt. Now the aggregate generating potential of the string of hydro-power plants on small tributaries of the Volga as well as on most of other valley rivers in the European part of the USSR.

The programme drawn up in the USSR for a broader utilisation of renewable energy sources provides for the construction of a number of hydro-power plants in the mountains of the Altay and the Caucasus, and the biggest power plants--beyond the Urals. Up to 80 percent of all of the USSR's hydro-power resources are concentrated in Siberia and the Far East.

The main construction sites are now on the Yenisey River, whose potential is evaluated at 60 and more million kilowatts. A string of electric power plants is being created. The Sayan-Shushenskoye hydro-power plant with a generating capacity of more than seven million kilowatts, the biggest of them, will be put on stream in the current five-year plan period (1986-1990). The project for the construction of a hydro-power plant of thrice as big generating capacity has been drawn up for the same river. Intensive hydro-power construction has also been started on the Far Eastern Amur River.

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[Article by V.G. Chirskov, Minister of Construction of Petroleum and Gas Industry Enterprises: "With a Course of Intensification"]

[Text] At the April (1985) Plenum of the CPSU Central Committee and the June Conference on Problems of Accelerating Scientific-Technical Progress, ways to a more rapid social and economic development for the country were determined. Shunting the economy onto the rails of intensification was directly connected with an increase in work efficiency by the sectors of the fuel-energy complex, which is called upon for steady provision of all types of fuel and energy for the country. The solution to this problem depends to a considerable extent on the workers engaged in oil and gas construction who create the capacities for the base sectors of the national economy.

The volume of construction and installation work specified by the yearly plans was fulfilled by the collective of the Ministry of Construction of Petroleum and Gas Industry Enterprises in the 11th Five-Year Plan a month ahead of schedule. The program which was determined for the sector by control figures for the five-year plan was completed as early as March 1985. We have also coped with the established assignment for the growth of labor productivity and in addition have carried out 1 billion rubles worth of work. In the five years the volume of construction and installation work carried out was almost 30 billion rubles, which is greater by a factor of 1.5 than the volume turned over in the 10th Five-Year Plan.

Over 85,000 kilometers of pipeline have been turned over for operation, including 57,000 km of main lines, i.e., 15,000 km more than in the 10th Five-Year Plan. Some 320 compressor and pump stations have been constructed. The introduction of basic projects for the oil and gas industry with respect to the extraction and transport of hydrocarbon raw materials has been ensured.

As compared with the past five-year plan, the sector has had a considerably broader program for housing and cultural-everyday construction: as was outlined, about 9 million square meters of housing, preschools for 52,000 and general education schools for 80,000 students were put into operation.

The construction organizations of the Ministry of Construction of Petroleum and Gas Industry Enterprises solved the purposeful problems advanced by the 26th CPSU Congress in the 11th Five-Year Plan. The six-line system for the transcontinental gas pipelines Western Siberia-Center-Western Europe, unique in the engineering-technical respect, was constructed ahead of schedule. Its total length is over 20,000 kilometers and its throughput capacity is 200 billion m^3 of gas per year. The export gas pipeline Urengoy-Pomary-Uzhgorod, extending 4451 kilometers, entering this system, was completed in record time.

Due to the high work rates at the gas industry construction sites and the construction of pipelines and compressor stations in synchronism with the increase in capacities at the fields, the gas pipelines Urengoy-Ukhta-Gryazovets-Moscow, Urengoy-Petrovsk, Urengoy-Novopskov, Urengoy-Pomary-Uzhgorod, Urengoy-Center-I and Urengoy-Center-II were operating at planned capacity within a year after completion of their construction. The national economic effect of the projects turned over for operation by the Ministry of Construction of Petroleum and Gas Industry Enterprises ahead of schedule was to a considerable extent promoted by the fact that the substantial addition to resources made it possible to level off the country's fuel balance in the most stressed period.

By constructing the planned projects ahead of schedule, the collectives of the sector succeeded in developing a stockpile for gas pipelines for the 12th Five-Year Plan and thus to fulfill their commitments for the 27th CPSU Congress. The Yamburg-Yelets-I gas pipeline was to be put into operation in the second quarter of 1986, but its construction is practically completed.

As is known, the work rhythm of the Western Siberian oil and gas complex to a considerable extent determines the progress of the entire national economy. An exceedingly important role is assigned to the economic strategy for the region's development. This imparts even greater weight to the achievements of the sector in Western Siberia. Seven major administrations for the sector, 64 trusts and the construction-installation organizations equated to them work here under exceedingly complex natural-climatic conditions. About 200,000 people in all work in Tyumen Oblast. The forces are impressive. There are further matters, however. During the period of 1981-1985 the work volume fulfilled in Western Siberia was 1.6-fold greater than in the preceding five years. The five-year plan for this indicator was fulfilled as early as December 1984. Over 600 million rubles worth of construction and installation work in addition was carried out. Now the collectives working in Tyumen Oblast have 51% of all the programs in the sector. In 1980 it was 44.3%.

The first important step in creating the Caspian petroleum and gas complex was taken in the 11th Five-Year Plan. Capacities were constructed to extract petroleum with units for sulfur refining and drying gas at the Zhanazhol field. A year ahead of the outlined period, a complex of projects for a new gas condensate deposit in Karachaganak was put into operation, and it is estimated for a yearly extraction of 3 billion cubic meters of gas and 2 million tons of condensate.

In the 11th Five-Year Plan the petroleum specialists obtained a weighty supplement to the fixed capital. The Surgur-Polotsk oil pipeline reached full

capacity. Western Siberian oil went to the consumers along the new pipelines--Kholmogory-Surgut-Perm-Klin, and Pavlodar-Chimkent, Groznyy-Baku and Saratov-Kuzmichin. Over 9000 kilometers of main oil pipelines were put into operation in the five-year plan. Work has begun on the unique product pipeline for the transport of a broad fraction of hydrocarbons from plants in Western Siberia to the Volga area.

The workers of the Ministry of Construction of Petroleum and Gas Industry Enterprises have also done a great deal of work to develop other sectors of the industry. Capacities for the output of depth booms and pipe-laying machines have been put into operation at the Ochersk Machine Building Plant, as well as tanks to transport liquid fertilizers at the Neftekamsk Dump Truck Plant and nonwoven materials at a factory in Tuymazy. New production capacities have been developed at the hosiery-stocking factory in Almetevska.

The workers of the sector have also made their contribution to the realization of the Food Program. A seed-processing shop has been introduced at the Bayram-Ali Oil and Fat Combine. A wing has been built at the Belebey test-experimental plant, where the production of machines and equipment for livestock breeding and fodder production was located. Projects for agricultural complexes such as poultry farms, hothouse combines and livestock raising complexes were turned over on time in Tyumen Oblast, Bashkiriya and the Tatar ASSR.

The sector is also systematically developing its own machine building, which is a great aid to the technical equipment for the construction workers. Industrial enterprises manufacturing rotor excavators and horizontal drilling units, Tyumen marsh-crossing vehicles and other units have increased the volume of commercial output in the five-year plan by 32%.

Scientific-technical progress is a main direction in intensifying the economy. The scientific potential created in the sector and the technical policy worked out have a direct effect on improving the results of the ministry organizations activity. In ensuring a high-speed increase in the capacities of the oil and gas industry, the Ministry of Construction of Petroleum and Gas Industry Enterprises implemented a number of major transformations in capital construction technology, raising the level of its industrialization. The scientists in the sector are giving special support to the development of equipment new in principle, ensuring a sharp rise in labor productivity. Organizations of the USSR Academy of Sciences and of the union republics, and VUZ science are being drawn in to this work on a broad scale.

The close creative collaboration of scientists from the Institute of Electric Welding imeni Ye. O. Paton and organizations of the Ministry of Construction of Petroleum and Gas Industry Enterprises has made possible, for example, a considerable expansion of the scale of introducing new pipe-welding complexes. A range of machines to contact-weld large-diameter pipes has been presented, and they have been thoroughly tested in various climatic zones. The enterprises of the Ministry of Construction of Petroleum and Gas Industry Enterprises have perfected series output of this equipment.

Today our advanced industrial flow lines lay up to 100 kilometers a year of pipelines 1420 mm in diameter. The sector's production potential makes it possible to introduce 5000 kilometers of large-diameter pipelines each year. There could, of course, be no question of this if advanced technology, machine systems and flow methods of pipeline construction organization had not been developed.

Following after the earth's prospectors, the construction workers are constantly improving their technical "equipment," adapting it to the varying soil and climatic conditions. The joint efforts of the scientists and practical workers in the sector have created over 50 new industrial processes, including a machine complex for the construction of pipelines in permafrost and in oil and gas deposits with a high sulfur content in swampy territories. The sector has gained experience in constructing special pipelines to transport ammonia, ethylene, condensate and gas with a high hydrogen sulfide content.

The sector's construction and installation organizations are processing over 5.5 million tons of assorted pipes a year. Many years of experience in studying their characteristics have made it possible to work out rigid technical requirements for pipelines for the most varied purposes. By adhering to them, the metallurgists are developing a more economical pipe rolling assortment. The Kuybyshevtruboprovodstroy Trust, for example, laid the first experimental-industrial sections of main gas pipelines made of thermal strengthened spiral pipes 1420 mm in diameter, supplied by the Volga Pipe Plant. Some 56 tons of steel and 167 kg of welding electrodes will be saved per kilometer of the main line.

The experience accumulated by the Soyuzpodvodtruboprovodstroy Association in constructing underway project sections for underwater crossings must rightfully be counted among the technical achievements of the five-year plan. Building the crossings with a diameter equal to that of the basic main line will reduce the number of lines laid and will reduce the amount of excavation and earth moving work by 40 percent. Advanced technology for crossing water obstacles has particularly proven itself in the construction of the transcontinental Urengoy-Pomary-Uzhgorod gas pipeline. The planners, as well as a number of workers in our sector, were awarded the USSR State Prize.

About 300 developments have been included every year in the sectorial plan for the introduction of new equipment. The technical improvement of production has set as its goal reducing labor input on line and surface construction, raising labor productivity and reducing the number of workers, i.e., solving the urgent problems of an increase in the efficiency of capital construction. All the goals to introduce innovations have, as a rule, been fulfilled. As a result, the economic effect of technical improvement in the sector was 1.8 billion rubles, conditionally releasing 50,000 persons.

The rise in the technical level of oil and gas construction is characterized by the following indicators: power to weight ratio--about 40 kw/person (in line construction 50-60), machine productivity--13,300 rubles per person (as compared with the preceding five-year plan this indicator rose by a factor of almost 1.5, and the energy-intensiveness per million rubles of construction and installation work did not increase). The utilization factor of the machine park rose by 13 percent.

The fact that the workers in the sector are fulfilling the plan, not at any price, but caring about a rise in the efficiency of capital investments, is also evidenced by the economic indicators characterizing the work collectives' expenditure of the resources entrusted to them. The five-year assignment for bringing commodity-material values into economic turnover was fulfilled by the ministry ahead of schedule. In increasing the work volume by a factor of almost 1.5, the spare construction material stocks grew by only one-fourth. Our level of uncompleted production is one of the lowest among the construction ministries. The organizations of the sector also coped with the task of reducing the cost of construction and installation work. The number of organizations operating at a loss was reduced as compared with the past five-year plan.

The consistent implementation of a purposeful comprehensive program to improve the economic mechanism in the sector, which, as is known, was developed for up to 1990, contributed in many ways to more efficient use of human and material resources. In the 11th Five-Year Plan, for example, a great deal of what was outlined by the master plan for sectorial administration was realized. The project and territorial specialization of the main production administrations has been carried out. After strengthening the trusts, subdivisions were created that were capable of doing the entire complex of work at the site and turning the ready projects over for operation on time. Mobile subcontracting trusts were organized and they are carrying out the block-unit construction.

Rearrangement of the organizational structures made it possible to increase the concentration of construction and to form a more operative administration and intensify the responsibility of the subdivisions for putting the projects into operation promptly.

Broader use of economic methods of administration contributed to orienting the construction organizations not to volume, but to projects completed and turned over. Formerly the sector passed over other ministries for the planning and evaluation of activity with respect to commodity construction products and an advanced form of crediting input for uncompleted construction. At all the industrial enterprises, the production volume is now counted by the "gross" but according to the indicator of the normative net product, which is fixed only by its "own" labor and is a more objective criterion in determining labor productivity and the wage fund.

What has been achieved, as is confirmed by a comparison with the best results of domestic and foreign industrial construction, basically meets the requirements of an intensive type of production. The sector ended the five-year plan with technical-economic indicators which reinforced its prestige in the capital construction system. At the same time, this result would not have been possible without the active work at the site of the party, Soviet and trade union organs and the komsomol, and without the stepped-up work of the organizations of purchasers, metallurgists, machine builders and transport workers--all those who take part in realizing the USSR Energy Program.

Still, we must not be satisfied with the achievements. Our task is to move even more quickly along the path of intensifying oil and gas construction and of

increasing its mobility and efficiency. The Basic Directions for Economic and Social Development for the 12th Five-Year Plan and for the Period up to the year 2000 contain developmental rates for the country which should ensure its emergence to advanced milestones in labor productivity and efficiency in the economic system. The sectors of the fuel-energy complex are faced with the problem of stable supply of the country's needs for all types of fuel and energy, both with respect to increasing their extraction and production and by virtue of the economic system.

While in the 11th Five-Year Plan for the gas industry, the extraction output was planned for 600-640 billion m^3, it now has an even more stepped-up program of boosted development. In 1990 gas extraction should reach up to 835-850 billion m^3. The collectives of our sector should create the conditions, i.e., build capacities corresponding to the volume of extraction and transport. The Yamburg, Karachaganak, Astrakhan and other gas condensate deposits should more rapidly be subordinated to the needs of the national economy and prepare the base for organizing the extraction of "blue fuel" on the Yamal Peninsula.

The oil field workers are also slated for an increase in the volume of oil extraction. They must open up complex beds, in more difficult regions, and mainly by forced extraction. This is the specific nature of the industry and, unquestionably, is reflected in the nature of our work. The volume of surface construction entailed in opening up the deposits will grow considerably as compared with the line. The organizations of the sector should develop additional capacities in Western Siberia, the Kazakh SSR and in the north of the European part of the country, and open access to deep-seated oil and condensate deposits in the Caspian lowlands so that the oil workers can extract 630-640 million tons of oil and gas condensate by 1990.

In the 12th Five-Year Plan the Ministry of Construction of Petroleum and Gas Industry Enterprises is faced with putting into effect a construction program that is the largest of all the preceding years. The volume of construction and installation work in the five-year period must increase by 33%, even though the increase in the volume of contracting for all the capital construction is established at 15-16%.

By 1990, the volume of contracting construction and installation work done by the sector should exceed 8.5 billion rubles. In 1985 it was 6.4 billion rubles. The relative significance of surface construction in the ministry's program will be more than 65% as against 51% in 1985. Labor productivity must increase by 25% in the five-year period in line construction and by 17%--for surface.

In characterizing the plan for 1986, at the fourth session of the Eleventh USSR Supreme Soviet, CPSU Central Committee General Secretary, Comrade M.S. Gorbachev emphasized the fact that in the plan for the first year of the five-year plan there were also built-in growth rates for the national economy which would determine a precise rhythm for the entire five-year plan. This specific feature also distinguishes the plan for the sector for 1986. At the start of the five-year plan an 8% increase in the construction and installation work volume was specified. The plan is complex, but realistic--balanced with the material and technical resources. All the work collectives in the sector developed the necessary organizational-technical measures under it, so that the sector's developmental rates were made fully feasible.

In the 12th Five-Year Plan the ministry's collectives are to construct over 80,000 km of main gas and oil product pipelines, 70,000 km (by a factor of 2.5 more than in the 11th Five-Year Plan) of industry pipelines, 360 compressor and oil pumping stations and gas preparation units with a total capacity of 284 billion m^3 and for oil--for 194 million tons a year.

The basic increases in oil and gas extraction outlined by the Energy Program for the Basic Directions is intended for the Tyumen fields. In accordance with the decree of the CPSU Central Committee and the USSR Council of Ministers on the comprehensive development of the oil and gas industry in this region, the oil and gas condensate extraction volume should reach up to 422-437 million tons here, and for gas--up to 560-565 billion m^3. The utilization level of oil gas is to rise to 90%.

Solving this problem requires a sharp increase in the capital construction volumes. Some 23.9 billion rubles--this is the volume of contracting work which the ministry organizations in Western Siberia are to fulfill in the 12th Five-Year Plan. Considering the fact that in the 10th Five-Year Plan they realized 15.2 billion rubles here, the construction volumes must be raised by a factor of 1.6. In the five-year plan the work proportion for oil will rise sharply and will be 8 billion rubles, i.e., greater by a factor of 1.9 than in the 11th Five-Year Plan.

The major construction project of the new five-year plan is the six-line gas transport system extending from the Yamburg deposit to the center of the country and the western boundary of the USSR. The total length of the pipelines is 28,700 km. Some 170 compressor stations will be built on the main lines. The building development, under the conditions of the Arctic Yamburg gas condensate deposit, includes the development of capacities estimated for the extraction of considerable volumes of gas and condensate per year.

The program for work in Western Siberia at projects of the petroleum industry specifies the building up of 46 new deposits (in the last five-year plan 30 were developed). They are all located in regions that are difficult of access.

Speaking at the conference of the party-economic aktiv of Tyumen and Tomsk oblasts, M.S. Gorbachev stressed the fact that to yield higher growth rates for construction in Western Siberia there must be an expansion of the scale of work connected with improving the everyday, above all housing, conditions for the construction workers themselves. This comment must be taken as a criticism, since housing construction for workers in the sector is lagging behind production construction. We have overly relied on the system of a general purchaser and contractor for the construction of housing proper and have worked too little on developing the initiative of the working collectives. As a result, more money was assigned, but the increase in housing obtained was negligible. This situation must change radically in the 12th Five-Year Plan. All the working collectives are obliged to take part in solving the housing problem. Funds were released for the development of the construction base proper and for the social infrastructure that are greater by a factor of

2.5 than in the 11th Five-Year Plan. The increase and introduction of housing must grow in these same proportions. There must be as many children's pre-school institutions, hospitals and polyclinics built in Western Siberia as were built in the last 20 years.

Development of the Caspian oil and gas complex, which is mentioned in the Basic Directions, for our sector means creating on its territory, by 1990, capacities for the extraction of 22 million tons of oil and gas condensate, 26 billion cubic meters of gas and the production of 4.8 million tons of sulfur. Contracting work worth 1.8 billion rubles is to be carried out for this. A set of projects which our organizations working in the Caspian depression should erect has also been suggested.

Of course, to carry out a stepped-up program of this scale requires decisions new in principle and basic on equipment, technology, organization and economics of oil and gas construction and its administration. It is a question of developing and putting into effect a complex of measures making it possible to transform organizational and economic methods of administration into a real factor of intensification, able to ensure a sufficiently rapid yield and to facilitate the solution of the problems facing the sector.

Therefore, not only must a sharp improvement be achieved in planning the production-economic activity, the role of the plan in accelerating scientific-technical progress must also be intensified. This means that the importance of the program-purposeful profile of the plan for the sector's development will increase. Measures for the scientific-technical development of the Ministry of Construction of Oil and Gas Industry Enterprises in 1986-1990 are becoming the basis of an administrative system for the intensification of oil and gas construction. They encompass an improvement in practically all the production-economic activity, including mechanization and automation of construction, reducing manual labor, technical reequipment and renovation of enterprises, development of automated control systems, introduction of computer equipment and the development of means of communication.

It is particularly important that the measures encompassing the main directions of the sector's production, technical, economic and social development acquire the status of purposeful scientific-technical programs and become the objects of national economic planning. For example, the major interbranch program, Blok, coordinates the work of those participating in the development of the block-unit method of building objects for the oil and gas industry and ensures planning-economic conditions directing machine builders, designers, purchasers, construction workers and other participants in the investment process toward developing capacities on the basis of highly efficient block-unit equipment, the use of which considerably reduces the period for constructing the objects.

Block-unit construction will be the basic method for developing deposits, including the Yamburg. In the 12th Five-Year Plan the volume of construction and installation work carried out by this advanced method must increase to 8.6 billion rubles, including to 6.4 billion rubles for Western Siberia, i.e. increase by a factor of 1.8 as compared with the 11th Five-Year Plan. The output of blocks and block unit layouts requires a rise by a factor of 2.7.

Along with expansion of the scales of using the block-unit method, there must be an improvement in its technological and technical base and transition to a new generation of compact production facilities. A promising direction in this matter has already been determined. It is a question of developing oil and gas projects by using superblocks. They were used for the first time in opening up oil fields. A unit with a mass of up to 400 tons was mounted on block-pontoons and taken across water and dry land to the installation site.

At the Yamburg gas condensate deposit the first sections for complete preparation of gas (UKPG) will be constructed from superblocks with a mass up to 350 tons. It is a development of the SibNIIPIneftegazstroy and YuzhNIIgiprogaz institutes and the Sibkomplektmontazh Association. The first 23 superblocks were transported by water from Tyumen to Yamburg in the navigation season of 1985 for a distance of 2500 kilometers.

The economic advantage of using superblocks has already been proven. The labor-intensiveness of constructing the technological wings of the UPKG, using superblocks, was less by a factor of 3 than when using blocks of reinforced concrete dimensions. Converting construction to superblocks with a mass of 1000-1500 tons will make it possible to supply the sites with fully completed objects. The task of the collective of the Sibkomplektmontazh Association is to create and develop as quickly as possible a new base for the construction of superblocks, the design for which is already being carried out at Tyumen. By the end of the five-year plan, 500 units a year should be turned out here.

The use of superblocks with a mass up to 1500 tons is held back due to a lack of transport means to deliver them to the installation site. Today there are solutions making it possible to transport heavy industrial units by wheel and caterpillar tracks. The Truboprovodtransmash Design Office developed at the Sibkomplektmontazh Association, is engaged in working out units using an air cushion with a carrying capacity of up to 1000 tons. The point is to put these plans into life more quickly.

The advancing increase in surface construction of objects for production purposes requires a new level of the sector's industrial-construction system. It is quite obvious that fully cast, completely supplied structures must be used, not in exceptional cases, when ordinary methods of construction are not used, but everywhere for the purpose of saving labor and resources and reducing the periods for building the projects. Not only the sector's workers must work for this, but also the machine builders. They still supply equipment loose, but for the industrial method of construction, project-items are needed. A program for widescale use of block units has already been worked out with the machine builders. The only thing needed is to carry it out precisely.

An important factor in intensifying oil and gas construction will be broad distribution, in the 12th Five-Year Plan, of duty-dispatch forms of labor organization. Actually, for Yamburg, for example, the traditional method of building up practiced to develop the Medvezh and Urengoy deposits is not acceptable. The natural climatic conditions of the region are such that

the organizations of the sector must not count on a "settled" way of life The entire volume of construction and installation must be carried out by the special duty method. This, of course, saves resources: really, just to ensure permanent housing for the gas workers and construction workers under conditions of Yamburg would require over 1 billion rubles of capital investments. The special duty system, however, poses many problems connected with creating comfortable temporary housing in the field area and permanent housing in the base cities and with transport provision for construction. None of these are simple problems, but the methods of solving them are well-known.

In uninhabited regions, not only should production capacities be constructed with mobile units, but also residential buildings. A flexible social infrastructure should be created by building field mobile and fixed settlements by the block-unit method. There must be a transition from delivering individual buildings to the construction sites to transporting norm-units of field settlements with from 50-500 persons living there. Among them should be dormitories, dining halls, recreation and reading rooms, cultural-health and sports complexes, medical centers and every-day service wings. The enterprise capacities producing mobile buildings with improved conditions for living and social services should develop up to 360-370 M^2 of space per year.

A large reserve for increasing the efficiency of capital construction is to develop methods of year-round work in the swampy regions of Western Siberia. Under an experimental procedure, the technological solutions based on available transport and means of mechanization have already been tested on the routes of main and field pipelines. Using the technology of summer construction, the machine park is most fully loaded, human resources are better utilized and the periods for building the projects are reduced. Seasonal fluctuation in work is still being eliminated slowly, however. The introduction of year-round technology requires other rates and another approach.

A major new scientific-technical task of the Ministry of Construction of Petroleum and Gas Industry Enterprises in the present five-year plan is to develop hydrotransport of coal and ore materials. The first practical step in solving this problem will be construction of a main coal pipeline from Belovo Kemerovo Oblast the Novosibirsk TETs [heat and electric power plant]. Nothing interferes with taking this step now, neither science nor design, nor complete sets of units. Everything depends on the coordinated work of the organizations of Glavvostoktruboprovodstroy.

The industrial enterprises of the sector are called upon to increase their contribution to accelerating scientific-technical progress. Considerably larger capital investments for technical reequipment and modernization of its own base are being allotted in the new five-year plan than in the 11th Five-Year Plan. Half of the funds released will be spent on replacing the asset part of the production funds, above all at the enterprises of sectorial machine building, which improve the provision of construction organizations with machines and mechanisms and create a reliable base for their repair.

In renewing the fixed capital at industrial enterprises, the need to increase its efficiency should be more keenly felt. The existing capacities, however, because of poor production and technological discipline, are still not fully utilized, as for example, at the enterprises of Glavneftegazpromstroy, Glavtatneftegazstroy, Glavtruboprovodstroy and other organizations. This stems in particular from the fact that the collectives have not yet been concerned in earnest with certification and making the work places more efficient. After all, just by correct arrangement of equipment and improving the work conditions with those capacities the product output can be increased by 5-10%.

Raising the level of the planning work and improving the economic mechanism on the whole will be implemented within the framework of the sectorial subsystem of the Unified System of Planning Capital Construction. It specifies solving a set of problems, including prediction, long-term and current planning and preparing normative indicators of the work of the construction organizations. The system ensures automated information gathering, accumulation and processing, optimization of the basic planning decisions and monitoring the course of construction at projects of vital state importance. At any time a director can get from the machine a document, convenient for reading, in which, as in a mirror, can be seen the fulfillment of the plan in a certain trust, main administration, territorial administration or oil and gas complex.

The program for improving the economic mechanism in the 12th Five-Year Plan will place as its goal further development of economic initiative and socialist enterprise, and expansion of the rights and increase in responsibility of the organizations and enterprises for the end results of the work. It will help to clarify the greatest weak spots in the economic mechanism and work out measures directed toward eliminating them.

A search must be made for new, more advanced forms and methods of economic operations. Even now it is necessary to implement certification of the subdivisions in the sector, reveal the reasons preventing them from working better and outline ways to increase the efficiency of capital construction. In 1986-1987, in line and land trusts, an experiment must be made in expanding the rights of organizations of the basic production unit and increasing their responsibility for the end results of the work.

The labor collectives of the Ministry of Construction of Petroleum and Gas Industry Enterprises have accumulated rich experience in organizing socialist competition directed toward solving the key problems of the sector. Along with implementation of a set of measures for technical reequipment of the organizations and enterprises, improving the economic mechanism and regulating organizational structures, healthy work rivalry contributed to a considerable extent to ahead-of-schedule plan fulfillment in the 11th Five-Year Plan.

At the same time, the forms and methods of competition do not yet answer to the nature of the present stage of economic development. As was justifiably noted at a meeting in the CPSU Central Committee with veterans of the Stakhanov

movement, and advanced workers and innovators in production, socialist competition lacks a clearer orientation toward priority aims: increasing labor productivity, improving the quality of the output and saving resources. The rates, quality, thrift and organization--those should become the aim of work rivalry.

In the 12th Five-Year Plan, we must achieve the organic inclusion of socialist competition in the economic mechanism, i.e., ensure its interrelation with planning, cost accounting, scientific-technical progress and other elements of the economic mechanism.

The system of moral and material incentive for shock work must also be improved and the store of means to publicize the results of the competition and disseminate the best achievements must be expanded and up-dated. The leading workers should always be in the public eye. You work well and for you there is recognition and material incentive. Poor workers must be punished both morally and materially, without any qualms.

The sector has accumulated definite experience in using new forms of labor organization based on contracting principles. In many organizations, strengthened basic collectives—brigades, sections, flows--are working together in unison. Some 55% of the entire work volume is fulfilled in the sector by the brigade contracting method. In a word, there is someone to whom to be oriented --for example, the strengthened comprehensive cost accounting brigade-section of the Megiongazstroy Trust, directed by N.P. Nezhdanov. The collective uses flow construction methods, since most of the workers have related vocations, and the number of subcontractors at the projects is reduced to a minimum. The wages of the workers, including the line engineering-technical workers (ITP) are set by agreement for the end result--the project turned over for start-up and adjustment work. The brigade, numbering 105 persons, carries out the entire complex of general construction work with a volume of 2,250,000 rubles for the construction of pressing and compressor stations. The collective fulfilled the assignment for 1985 by 125%, and the output per worker rose by 20% above that planned.

It must be confessed, the brigade has not yet become the basic unit and object of administration in oil and gas construction, and basic cost accounting is in many ways introduced only formally. The attempt to insert advanced forms of labor organization in small collectives, however, does not and cannot give the proper yield.

The basis for increasing the efficiency of local cost accounting should be the constant, painstaking formation of strengthened basic collectives, their transition to cost accounting and increasing the interest in the end results of the work of line engineering and technical personnel. The task is set--to bring the number of brigades, sections and flows to 2500 by the end of the 12th Five-Year Plan. At least 65-70% of the volume of construction and installation work is outlined to be fulfilled by the brigade contracting method by 1990.

It is important to reorganize the psychology of organization directors, engineering and technical personnel and brigade leaders and to get rid of the cabinet style of work. Improving production administration is incompatible with conservatism in economic and administrative thinking, with obsolete forms and methods of direction and superfluous administrating. We must lean on the collective and know how to combine unified management with the widescale participation of the workers in the collectives in production administration. A director of any rank should become not a "chief" invested with power, but above all an engineer-organizer. His main duty is not only to ask to see the work, but also to create for the collectives the conditions for the work to be done without interruption, with high productivity and with good quality.

The fate of the new five-year plan is being decided at the work places--in the ministry, main administration and trust, at the construction site. All the workers in the sector should understand the vital necessity of a sharp turn toward intensifying oil and gas construction.

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PIPELINE CONSTRUCTION

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GAS TRANSPORT COMPLEX EXAMINED

Moscow STROITELSTVO TRUBOPROVODOV in Russian No 2 Feb 86 pp 16-18

[Article by A.M. Krayzelman, chief of GlavPRU of the Ministry of Construction of Petroleum and Gas Industry Enterprises: "A Gas Transport Complex--Into Operation"]

[Text] Increasing the extraction of Siberian gas and solving the problem of its transport was a task of primary economic and political significance, an extremely important factor in putting into effect the USSR Energy Program. Constructing a six-line system of main lines 1420 mm in diameter with an overall length of over 20,000 kilometers to transport gas from the northern rayons of Tyumen Oblast to the European part of the country and for export was designated the principal construction project of the 11th Five-Year Plan.

Along with the Ministry of Construction of Petroleum and Gas Industry Enterprises, the organizations of over 30 ministries and departments were drawn in to the construction of the gas pipeline and solving the technical and other problems of ensuring the construction.

The production, scientific-technical and organizational-economic potential created in the sector by the beginning of the 11th Five-Year Plan was the initial basis for fulfillment of this large-scale task.

The Ministry of Construction of Petroleum and Gas Industry Enterprises put into effect serious measures directed toward radical reorganization of main pipeline construction, a rise in the technical and organizational level and improvement of the economic mechanism and administration of construction.

Production, cost accounting main administrations were created. Line trusts, formerly specialized in their types of work (welding-installation, excavation and earth-moving, insulation-laying), were reorganized into comprehensive pipeline construction trusts. This contributed to a rise in responsibility for performing all line work with their own forces and for ensuring that the sections commissioned to the trust were put into operation on time.

The work began to be carried out by large comprehensive technological flows, under unified direction, instead of small, separate brigades governed by various trusts. As a result, the interaction of the brigades has improved and a transition to new work principles has been outlined--from mutual grievances to mutual support.

In the years of the 11th Five-Year Plan the ministry did a great deal of work on technical reequipment for the technological flows. Thirty-eight of these flows, whose forces were concentrated on constructing the gas complex, were made into a complete unit with powerful, highly productive excavators, bulldozers, pipe length carriers, pipe layers, automatic welding units, combines to clean and insulate the pipes and filling and pressurizing units.

In 1981-1985, 20,000 machine operators were trained, the number of operators needed for the automatic welding complexes and overhead-welders.

The organizations of the ministry obtained 20 Sever complexes and 37 Styk complexes, the series output of which was developed by plants of the Ministry of the Electrical Equipment Industry, and over 1400 kilometers of pipeline were welded by means of them.

A considerable amount of welding work (over 4000 km) was done at type BTS bases, placed on the lines by the Kiev Experimental Mechanical Plant.

Rotary trench excavators ETR-254 with a power of 221 kw, designed to lay out trenches 2.5 M deep and 2.1 M wide, were created and are being produced in series to mechanize the excavating and earth-moving work. A modification of the excavator, with twice as much specific power, has been developed. The use of excavators with a bucket having a capacity of 1.5 m^3 instead of the one formerly used with a bucket having a capacity of 0.65 m^3 has contributed to an increase in the rates of excavation and earth-moving work in swampy sections. Series production of pipe layers with a carrying capacity of 50 tons. The use of powerful bulldozers with rippers made it possible to mechanize the trench laying in frozen and rocky soils. Equipment and technology for laying pipelines in permafrost soils has been developed.

Pipe length carriers with varying carrying capacity have been developed to transport pipes and pipe sections up to 36 M long and 1420 mm in diameter on the basis of motor vehicles with high cross-country travel ability.

Increasing the ballasting volume contributed to a rise in the reliability of the pipelines being constructed. Reinforced concrete weighting loads type UBO, with good stability at the pipeline, are being used everywhere. Introduction of ring-shaped reinforced concrete weights has begun.

The use of pipes with plant insulation has reduced the amount of cleaning and insulation work done under field conditions and has yielded an appreciable economic effect.

Laying the bed and floodplain parts of river crossings from pipes 1420 mm in diameter, equal to the basic gas pipeline section, was used for the first time in domestic and world practice. This made it possible to reduce the number of gas pipelines laid at the river crossings and eliminated the need to construct shore chambers to send out and take in the cleaning devices, and additional crane assemblies.

As early as the planning stage, on the initiative of the Ministry of Construction of Petroleum and Gas Industry Enterprises, a proposal was advanced on laying transcontinental main lines in a single power corridor, which ensured mutual saving of gas pipelines, contributed to simplification of their operation and made it possible to combine the communications devices and the electrochemical protection for several lines.

Constructing a multiline system in a single corridor subsequently made it possible to concentrate resources in the main directions and eliminate losses from over-basing. It became possible to develop work by stages on the new gas pipeline before completing construction of the preceding one, to construct two pipelines simultaneously, to distribute the work time efficiently and to concentrate resources at the underway sections.

The fact that the housing and base settlements of the flows remained during the construction of several gas pipelines made it possible to create favorable housing and cultural-every-day conditions, to organize the sanitation services and to improve the organization of food service, cultural services and leisure.

Throughout the five-year period the line sections were attached to specific pipeline main administrations. Within the limits of their sections, the main administrations mainly fixed work boundaries for each trust and for the comprehensive technological flows.

Particular attention was paid to creating and putting into effect systems of training, organizing and administering construction.

A sectorial plan for organizing construction in the five-year period, plans for organizing work at each main line and work plans for each comprehensive technological flow were subsequently worked out in the course of preparing the construction.

Carrying out these measures made it possible to balance the schedule for fulfilling the quarterly and monthly assignments with the material-technical resources and production capacities of the construction organizations and to create a basis for efficient construction planning and administration.

In the course of constructing the main lines, continuous business connections were maintained with the planning institutes and offices of the Ministry of Construction of Petroleum and Gas Industry Enterprises, its associations and managements.

The system of efficient planning and administration for construction of gas pipelines had four levels of administration: the construction project as a whole, the main administration, trust and comprehensive technological flow. The organ at the highest level was the construction headquarters, headed by the minister, whose staff included workers of the GlavPRU, functional main administrations and representatives of the purchaser.

The basic operations administration was the weekly-daily production planning, which made it possible to keep track of the actual production situation that had formed at the construction site, and next specific goals, the fulfillment of which ensured reaching the milestones established by the monthly schedule.

Selector conferences, held regularly by the minister within the framework of a weekly cycle of operations planning and administration for all the line construction objects, and compressor station, apartment house and social and every-day living projects played an important role in efficient construction administration.

A method of predicting using a computer produced specific administrative solutions.

Each of the six gas pipelines was constructed in periods considerably shorter than the norm.

The first offspring of the 11th Five-Year Plan was the gaspipeline system Urengoy-Ukhta-Gryazovets-Torzhok-MOK with a total length of 3372 km, made of pipes 1420 and 1220 mm in diameter, built in 20 months and put into operation in April 1981. The direct management of construction for the western section of this system was entrusted to the author of this article.

The construction project with the highest priority, particularly vital, was the gas pipeline Urengoy-Pomary-Uzhgorod, which contributed to the development of long-term economic relations between our country and the countries of Western Europe. It is generally known that imperialistic circles had undertaken a number of economic and political steps directed toward disrupting construction of this main line. The adventurous "sanctions", however, were decisively repulsed by the workers of our country.

The labor collectives of the Ministry of the Gas Industry and the Ministry of Construction of Petroleum and Gas Industry Enterprises came out as initiators of a competition to accelerate construction of the export main line and ensured its being put into operation ahead of schedule.

The patriotic initiative of the organizers gained broad support from the labor collectives of other sectors of the national economy. The entire country built the export main line. Not a single sector of the national economy remained aloof from this truly great construction project. The "main line of the century" was built in 16 months, was put into operation in August 1983 instead of April 1984 and reached planned productivity in the first year of operation.

When the last of the gas pipelines planned in the 11th Five-Year Plan, Urengoy-Center-II, was put into operation ahead of schedule, in April 1985, fulfillment of the task outlined by the 26th CPSU Congress of constructing six supercapacity gas main lines from Western Siberia to the European Center of the country was completed.

Thus, in the years of the 11th Five-Year Plan, twice as many pipelines 1420 mm in diameter were constructed as in the 10th Five-Year Plan.

The collectives of almost all the main production administrations in the sector made their contribution to constructing this gas transport complex (see table).

Glavvostoktruboprovodstroy, Glavtruboprovodstroy and Glavsibtruboprovodstroy make the greatest contribution to constructing the gas main lines.

With the introduction of the last compressor station--Ordinsk, at the Urengoy-Center-II gas pipeline, a five-year assignment in constructing compressor stations on this system was completed. They constituted over half of the total number of stations built by the ministry in the 10th Five-Year Plan.

Using the advantages of a single corridor made possible a considerable rise in the stability of the collectives engaged in constructing the stations. The average power of all the compressor stations introduced in the 11th Five-Year Plan rose noticeably as compared with the 10th Five-Year Plan. This contributed to a substantial reduction in the specific labor input per MW of power put into operation.

Introduction of unified designs with broader use of block-unit structures and a unified service-auxiliary zone for several stations made it possible to reduce the area for the construction site and length of the communications lines and to improve other structural and planning decisions. Introducing block-container units with increased power, GPA-Ts-16, made it possible to discard construction of cumbersome compressor shops and shelters. The central personnel and organizations of the ministry-purchasers, contractor, completing and implementing the start-up and adjustment work, as well as the local organs, paid constant attention to the planning, completeness of the units and construction of the compressor stations.

At the compressor stations of the most important main lines in the 11th Five-Year Plan, apartment houses with a total area of over 250,000 M^2, schools for almost 6000 places, kindergartens for 2600, polyclinics for 2000 visits, hospitals and facilities for cultural and every-day purposes were constructed.

The overall cost of this gas gas transport complex, the largest in the world, with a productivity of 200 billion m^3, is estimated at 15 billion rubles, which exceeds the input to construct BAM, KamAZ, the Volga Motor Vehicle Plant and Atommash, taken together.

Contribution of Main Administrations to the Construction of the Gas Transport Complex

Main Administration	Total for Gas Transport Complex	Gas Pipelines					
		Urengoy-Gryazovets-MOK	Urengoy-Petrovsk	Urengoy-Novopskov	Urengoy-Uzhgorod	Urengoy-Center I	Urengoy-Center II
	21323/124	3372/20	3147/20	3517/23	4751/23	3331/19	3105/19
Glavyamburgneftegazstroy	4/19	-/2	-/3	-/2	-/4	-/4	-/4
Glavurengoygazstroy	-/4	---	---	-/1	-/1	-/1	-/1
Glavsibtruboprovodstroy	5660/35	853/6	1043/7	970/7	940/4	985/5	869/6
Glavtyumenneftegazstroy	-/3	---	---	---	-/2	-/1	---
Glavvostoktruboprovodstroy	7403/9	573/-	1176/3	1171/3	1488/1	1518/1	1477/1
Glavtruboprovodstroy	6244/3	1571/-	585/1	922/2	1479	928	759
Glavbashneftegazstroy	-/10	---	-/4	-/3	-/1	-/1	-/1
Glavneftegazpromstroy	-/8	-/3	-/2	-/3	---	---	---
Glavinterneftegazstroy	462/16	---	99	101	262/8	-/4	-/4
Glavkomigazneftestroy	-/5	-/5	---	---	---	---	---
Glavtatneftegazstroy	-/9	-/3	---	---	-/2	-/2	-/2
Glavyuzhtruboprovodstroy	509/2	122/-	---	137/2	250/-	---	---
Glavukrneftegazstroy	1045/1	253/1	244/-	216/-	332/-	---	---

Note: In the numerator is the length of the section constructed (in km); in the denominator--the number of compressor stations.

The construction workers of the gas transport complex, in compressed periods of time, delivered to the line and laid 12 million tons of large-diameter steel pipes, the length of the welds was over 9000 km, and they insulated 118 million m^3 of external surface of the pipes. The amount of excavation and earth work done is over 590 million m^3, and of them, almost 16 million m^3 in rocky soil. Over 29 million m^3 of soil were worked in the construction of 3181 crossings over water obstacles, including 96 crossings over large rivers such as the Volga, Kama, Ob, Nadym and Vyatka. An area of 27,000 hectares of forest was cleared. Land was recultivated on 6500 km of the line. Some 6.3 million tons of reinforced concrete weights were manufactured, delivered to the line and installed. Some 368,000 sets of anchoring devices were used to secure the pipelines at the planned levels.

The first years of operation showed the high reliability of the gas pipeline system created. In the construction period the requirements for the quality of the work were severe, especially for the welding and installation work. Beginning in 1983, a transition was made to 100% radiographic control of the butt joints in the Western Siberia regions, as well as at the pipeline sections of categories "B" and I, swamp crossings types II and III and railroads and highways.

Practical experience showed, however, that with high requirements for the quality and rigid control, it was impossible to avoid cases of deviation from the plans and violation of the norms, as happened, for example, in the Kazymtruboprovodstroy Trust. Therefore, particular attention had to be paid to raising the quality and strictest adherence to the norms and regulations.

Along with the building of the gas transport system, a great deal of work was done to build up the Urengoy gas condensate deposit and develop capacities to extract and prepare gas for transport.

In 1981-1985, in establishing the deposit, construction and installation was done at a cost of about 1 billion rubles, including 350 million rubles in 1985. Units for complete gas preparation with a sizeable capacity were constructed and put into operation here, and over 1400 km of field pipelines were turned over for operation.

A large production complex for extraction, transport and processing of gas condensate with a capacity of 5 million tons a year was created at the base of the Urengoy deposit. The complex included three units for complete preparation of gas, a unit to prepare condensate for transport, condensate pipelines, product pipelines and trails 920 km long and the first section of a plant to stabilize condensate in Surgut.

The city of Novyy Urengoy was practically built during the years of the 11th Five-Year Plan. Apartment houses with a total area of 550,000 M^2 with a complex of objects for social-cultural and every-day purposes were erected in the city. It is planned to use Novyy Urengoy as a base city in building up the Yamburg deposit in the future.

A large-scale economic experiment on converting the comprehensive technological flows to a unified cost accounting agreement for contracting, with the wages of all the workers, including the engineering and technical personnel in accordance with a unified order, was made in the process of constructing the gas pipeline system.

The new system of stimulation contributed to increasing the material interests of all the participants in the construction in fulfilling the assignments with the fewest personnel.

In the course of the experiment, the workers of the basic technological and auxiliary brigades of the flow were paid wages for the end product--sections of gas pipeline prepared for testing. The new system of material stimulation made it possible to pay bonuses to the engineering and technical personnel in direct relationship to the amounts of work and the periods for its fulfillment. Using the coefficient of labor participation made it possible to pay wages to each worker in consideration of his labor contribution to the end product. The input to fill out documents was considerably reduced. Instead of many hundreds of orders formerly issued, a unified contract order for the entire period of construction and the commissioned work volumes is now being established.

In the comprehensive technological flows working under the conditions of the experiment, as compared with the flows under traditional conditions, labor productivity per worker rose by 83%, with a 36% increase in wages.

Today, in construction of the Yamburg-Yelets gas pipeline system, work has been organized according to this principle in 16 flows of the Glavtruboprovodstroy and Glavvostoktruboprovodstroy, which adopted the heightened commitment to meet the 27th CPSU Congress in a worthy manner.

Socialist competition of the work collectives for ahead-of-schedule completion of construction and putting the gas pipeline into operation, developed along the principle of the "workers' relay race", has been widely developed at the construction project.

Technological flows directed by I.G. Shaykhutdinov and V.Ya. Belyayeva, heroes of Socialist Labor, A.A. Rekoshetov, USSR State Prize winner, A.K. Buyankin and others have passed the hundred-meter boundary of comprehensive construction of large-diameter pipelines.

Development of the initiative "Each Work Day--1 Kilometer of Pipeline Readied" has made it possible to establish a boundary for awarding a first-class place and prizes--6 km per week. This made it possible to depart from the former usual practice of determining the competition winners in accordance with the principle "who has turned over more" and to raise the work rates considerably.

Many workers and engineering and technical personnel were awarded orders and medals of the USSR and earned USSR State prizes for outstanding achievements in work on the construction of main gas pipelines in the 11th Five-Year Plan. The shock work of V.I. Satarov (Mosgazprovodstroy Trust), V. I. Kirilchik

(Samotlortruboprovodstroy Trust), A.G. Pridantsev (Kuybyshevtruboprovodstroy Trust), V.I. Danno (Ukrtruboprovodstroy Trust), N.I. Nikolayev (Tatnefteprovodstroy Trust), A.I. Shcherbakov (Vostokpodvodtruboprovodstroy Trust), A.S. Rakitin (Rostovtruboprovodstroy Trust), Ye.L. Volkov (Uralneftegazstroy Trust) and K. Sh. Khabirov (Vostoknefteprovodstroy Trust).

The powerful gas transport complex developed in the 11th Five-Year Plan has no equal in the world, and in its construction are integrally combined modern achievements in the sphere of planning, technology and new organizational forms and administration of the construction of large pipeline systems.

Putting into operation each of the six main gas pipelines ahead of schedule and fulfilling the assignments of the five-year plan for developing the gas transport system ahead of schedule were ensured due to the attention of the CPSU Central Committee and the USSR government, assistance from local party and soviet organs, trade unions and komsomols, the conscientious attitude toward the commissions of the ministries and departments of the country and the selfless labor of all the collectives participating in the creation of this system.

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WEST SIBERIAN FUEL COMPLEX DEVELOPMENT

Moscow STROITELSTVO TRUBOPROVODOV in Russian No 2,Feb 86 pp 19-20

[Article by V.M. Igolnikov, GlavterPRU, Tyumen: "The Development of the Western Siberian Oil and Gas Complex"]

[Text] The rates and quality of work of the collectives of the Ministry of Construction of Petroleum and Gas Industry Enterprises in constructing projects for the oil and gas complex in Western Siberia are decisive in increasing the capacities of the oil and gas industry. In twenty years of developing uninhabited Siberian land, large oil and gas extracting production complexes have been developed, main pipeline systems have been laid and new cities, industrial bases, railroads and highways have been built.

In the years of the 11th Five-Year Plan construction and installation work worth a total of 15.4 billion rubles was carried out in Western Siberia. During 1984-1985 a major program was implemented to create the necessary capacities for the extraction, preparation, transport and processing of gas condensate, in monetary terms over 400 million rubles. Some 32 new oil and gas deposits were introduced for development. The country's national economy began to obtain 1 billion m^3 of Tyumen gas per day.

The sector's organizations have done a great deal of work to design a social program in Western Siberia. The volumes of housing and cultural-every-day construction have doubled. In conjunction with the construction workers of the fraternal republics of the Ukraine, Lithuania, Latvia and Estonia and the cities of the Russian Federation, Leningrad, Sverdlovsk and Novosibirsk, apartment houses with a total area of over 5 million m^3, general education schools for 40,600 places, children's preschool institutions for 25,700 places, hospitals for 1350 beds and other objects were put into operation.

One of the decisive results of the past five-year plan was the further development of a powerful construction base; strengthening existing and creating new large construction collectives and building objects for the construction industry and building materials. There are 11 main administrations and 86 trusts, with 200,000 construction workers in Tyumen Oblast.

Unprecedented high rates for carrying out an entire complex of work, beginning with the planning and construction and ending with the development and erection of the new capacities at the planned levels are a distinctive feature of the last five-year plan. It was possible to attain these rates because of the widescale use of the newest achievements of science and technology, scientific organization of labor, an improvement in the administration and the introduction of complete mechanization and automation and advanced experience. Highly efficient technology and work organization were used in drilling, building up and developing the deposits and laying main lines.

A further development in block unit construction of oil field objects, oil pumping stations and gas processing plants, year-round construction of oil gathering networks, water lines to maintain bed pressure, gas pipelines, gas lift systems and systems for the utilization of casing-head gas, industrialization of erecting pile foundations under the units and tanks, use of high strength steels and wide-flange joists in manufacturing the metal structures, engineering preparation of the sites by means of direct hydraulic filling, introduction of highly efficient technology for thermal insulation of pipes and apparatus--this is by no means a complete list of the advanced technical solutions ensuring high work rates and a considerable reduction in the periods.

Automated complexes to extract and prepare gas with a unit capacity of 20 billion m^3 of gas a year were constructed for the first time in world practice under the complex conditions of the Far North.

Improving the block-unit method, combined with the introduction of flow organization of construction based on unified technology to erect buildings and structures, made it possible to cut work input at the sites almost in half and to reduce by a factor of more than 1.5 the periods for constructing compressor stations having 10, 16 and 25 mw power, and units, unique in their power, for comprehensive preparation of gas and condensate at the Urengoy deposit.

In the 11th Five-Year Plan, as the result of introducing new equipment and advanced technology, the pipeline collectives, ahead of schedule, built sections of the main gas pipelines Urengoy-Petrovsk, Urengoy-Novopskov, Urengoy-Uzhgorod and Urengoy-Center-I and II, and constructed the Yamburg-Yelets-I gas pipeline at high rates. The total economic effect was about 2.5 million rubles.

In the 12th Five-Year Plan, the volumes of construction and installation work in the Western Siberian region will increase by a factor of 1.6. Assignments to ensure the introduction of new capacities in oil and gas construction and construction of housing, objects for social and every-day purposes and construction industry and building materials bases are also considerable.

Fulfillment of the tasks of the 12th Five-Year Plan is made more complicated because of the rise in the work complexity coefficient connected with an increase in the general construction program of the proportion of surface

objects and small-diameter pipelines and dispersal of forces on a large number, yearly, of new oil deposits being established and on the emergence of gas deposits for establishment in the Arctic, with a complicated set of climatic, cryopedological and a number of other conditions.

Some 8 million M^2 of housing must be built, which is equal to the entire program of the last three five-year plans, and the introduction of schools must increase by a factor of 1.5 as compared with the 11th Five-Year Plan, of kindergartens--a factor of 2 and of hospitals--a factor of 4.

This program can be realized only on the basis of accelerating scientific-technical progress in oil and gas construction, raising the level of its industrialization, increasing labor productivity, using efficient forms of labor administration, organization and encouragement and a more complete solution to social problems.

In the construction of pipelines, the reequipment of welding production is to be implemented on the basis of widescale introduction of automatic electro-contact welding of pipelines from 57 to 1420 mm in diameter. This measure will make it possible to increase by a factor of 1.5-2 the productivity of welding work.

Ways to accelerate and improve the quality of land construction in Western Siberia are going via a new level of industrialization, specifying supply of objects as a whole at the construction sites, or for parts in the form of large blocks with a mass of 300-1000 tons. The block-unit method, using large blocks will make it possible to reduce by a factor of 4 the number of workers at the construction sites, to lower the cost of construction by 18-20% and considerably accelerate the periods for introducing the capacities. The Sibkomplektmontazh Association has manufactured the first 23 large blocks for the Yamburg deposit. The blocks were delivered to the construction site and are being set up successfully. The problem, however, lies in that, in an extremely short period, along with enlarging the blocks, there should be a transition to plant manufacture of completed block-objects, undergoing an entire set of trials at the plant testing units, and requiring only connection to the intershop systems of the site's engineering and technological facilities. This problem is to be solved in close collaboration with the purchaser and the machine building ministries, with sectorial and academic science and design organizations drawn in.

An important factor in accelerating the work and carrying it out with a guaranteed level of quality is introduction of the flow method of constructing land objects for the extraction, preparation and transport of oil and gas on the basis of unified technology. Work experience of the Surgutneftegazstroy, Kazymgazpromstroy, Urengoygazpromstroy, Hadymgazpromstroy and a number of other trusts shows that with a long-term flow, using unified technology to erect the objects, through repetition of the operations, improving the workers' practice, and with established interaction between the units and brigades, labor productivity at the construction site will increase by 10-15%.

In connection with an increase in the volumes of work on constructing field pipelines 57-500 mm in diameter and of objects for land building-up, a program for complete mechanization of this work on the basis of improved machines and mechanisms, balanced in capacity and productivity, takes on importance. It is a question of a new generation of machines, designed to fulfill a set of operations and giving completed building structures, capable of operating under summer and winter conditions at minimally prepared building sites, reliable in operation and sufficiently simple for technical service.

Construction conditions in Western Siberia, when projects are scattered over a huge territory without adequate transport communications in the course of the year, require early organizational and technological preparation for the work, in advance of the processed technical documentation, in close coordination with the periods for delivery of the equipment to enterprises manufacturing the block-units and to the site itself. To ensure these conditions, there must first of all be balanced plans specifying the precise program for issuing the documentation for the complete units of equipment and introduction of the objects a minimum of two years in advance. A delay in introducing continuous two-year planning leads to a lack of smoothness of the construction flow, to work involving "all hands" and to irreplaceable losses of time, resources and quality. Therefore, work with the purchasers on compiling balanced long-term programs for the construction flow is one of the most important problems today.

The complexity of solving the impending problems on yearly introducing for development 18-20 new oil deposits and ensuring yearly increases, unprecedented in the world, in the capacities to extract and transport gas from the remote regions of the Yamal and Gydan Arctic require even today searches be begun for advanced solutions, new in principle, on preparing the sites and structures for the projects, on methods of production and developing pipe-saving technology ensuring the reliability of the construction flow and high-quality output.

The collectives of the sector, engaged in building up the oil and gas deposits of Western Siberia, laid the bases for the duty-dispatch method of work as early as the 11th Five-Year Plan. Subdivisions of the Sibkomplektmontazh Association, Glavtruboprovodstroy, Glavvostoktruboprovodstroy, Glavyuzhtruboprovodstroy and a number of Glavurengoygazstroy are now working in accordance with this method. The volume and quality growth, however, of introducing the duty-dispatch method at the building-up of the Yamburg and new oil deposits, the development of the storehouses of the Yamal Peninsula and the creation of a large new gas transport system from this region to the European part of the country require immediate solutions to a number of problems. First and foremost of them is considerable strengthening of the social basis of the sector's organizations.

A deeper approach to organizing administration of the course of construction work in this region is needed in the 12th Five-Year Plan to fulfill the program for comprehensive development of the oil and gas industry in Western Siberia.

A computer complex for administration of a long-term, smooth construction flow, capable, on the basis of advanced technology, of solving multipurpose, complicated problems on the continuous optimal reliable functioning of this flow, should be created in the shortest time possible.

The high indicators for the work of the sector's work collectives in the 11th Five-Year Plan provide a basis for thinking that the forthcoming grandiose tasks for the development of the Western Siberian oil and gas complex will be successfully realized.

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PIPELINE CONSTRUCTION

CENTRAL ASIAN OIL, GAS INDUSTRY CONTRIBUTION

Moscow STROITELSTVO TRUBOPROVODOV in Russian No 2, Feb 86 pp 22-23

[Article by A.P. Khvostov, Glavsredazneftegazstroy, Tashkent: "A Contribution to the Development of the Oil and Gas Industry of Central Asia"]

[Text] The territorial main administration--Glavsredazneftegazstroy--was created at the end of 1983 on the basis of the construction organizations dislocated on the territory of three Central Asian republics--the Uzbek, Kirgiz and Kazakh SSR. Their production work, however, both before the organization of the main administration and now, is not limited to the regions where they are located, but stretches far beyond the borders of these republics. In the 11th Five-Year Plan the construction subdivisions of Glavsredazneftegazstroy took part in constructing such important pipelines as Ukhta-Gryazovets, Gryazovets-Moscow regional ring, Urengoy-Petrovsk, Urengoy-Uzhgorod, Khiva-Beyneu, Syr-Dar GRES-TashGRES, Pavlodar-Chimkent, etc. In all, over 3700 km of oil and gas main pipelines were built and put into operation.

Along with laying the pipelines, power transmission lines, cathode protection devices, compressor stations (KS) and oil pumping and gas distributing stations were constructed. Seven KS were turned over for operation and one compressor station was modernized, with an increase in power; five oil pumping stations were equipped; cable communication lines 1451 km long were included in the work. The subdivisions of the Mubarekgazpromstroy Trust built projects for preparing and processing gas at gas complexes in Kashka-Darya and Bukhara oblasts. Capacities for the extraction of 23 billion m^3 of sulfur gases a year were constructed and put into operation and the capacities of gas processing plants were increased by 12 billion m^3 of gas a year here in five years. Along with objects for production purposes, over 100,000 m^2 of general useful area in permanent apartment houses, children's preschool institutions for 840 places and a number of other objects for social and cultural purposes were turned over for operation. In the course of the last two years, through the efforts of the main administration, the city of Gazli, which had suffered a natural disaster--an earthquake--was practically built anew; by the end of 1984 over 25,000 m^2 of housing was constructed here.

In 1981-1985 the main administration carried out construction and installation work with a total cost of over 900 million rubles, which exceeds the five-year plan assignment by over 67 million rubles.

In the 12th Five-Year Plan the collectives of Glavsredazneftegazstroy are to make a worthy new contribution to the development of the country's oil and gas complex.

A large volume of work should be done under the complex conditions of the Central Asian region. Over 3800 km of pipeline, including over 1300 km of oil pipelines to transport Western Siberian oil to Uzbekistan and Turkmeniya are slated to be put into operation. Construction will be carried out in the desert and in the mountain sections.

Construction of the gas pipeline Gazli-Chimkent, 1220 mm in diameter and 626 km long, is to be completed in the first six months of 1987, to increase the reliability of gas supply for the southern regions of Kazakhstan and the central regions of the Kirgiz SSR. The special feature of laying lies in the fact that the route passes for practically its entire length in a zone of loose, fine-grained desert sand dunes.

Glavsredazneftegazstroy will take part in the accelerated development of a network of petroleum product pipelines. A petroleum product pipeline, Chimkent-Tashkent, 180 km long, should be put into operation in the Central Asian region. This construction project is of great importance for the national economy of the Uzbek SSR and the contiguous oblasts of the neighboring republics.

The need to maintain the achieved level of gas supply for the Central Asian region and the south of Kazakhstan, and its further rise requires intensive development of the deposits of gases containing hydrogen sulfide in Kasha-Darya Oblast. Glavsredazneftegazstroy is to introduce capacities to process 12 billion m^3 of gas a year at the Shurtan and 6.5 billion m^3 at the Mubarek gas complexes with corresponding capacities to obtain sulfur, condensate and other products of refining.

Intensification of the gas industry in Central Asia has brought about the need to construct 11 new stations and expand 2 existing ones, including 2 stations for work on sulfur gas. The plan is to construct eight oil pumping stations, six of them on new mainlines. Four mobile gas-filling compressor stations for 2000 refuelings a day will be turned over for operation.

The considerable volume of work on constructing land objects can successfully be carried out by virtue of widescale use of the block-unit method and a further rise in the level of industrialization of construction. An increase in labor productivity is also specified through introducing its scientific organization, complete mechanization and automation of the production processes and reducing manual labor input in general construction work.

The organizational structure of the main administration is being improved in order to raise the level of construction administration. In connection with the increase in work volumes, the Mubarekgazstroy Trust-Site was reorganized in the construction and installation trust, and construction administrations were specified as part of its structure. The construction administrations of the Sredazneftegazstroy Trust have been strengthened. A unified transport

organization has been created for the main administration--a production combine. Work experience in 1985 confirmed the expediency of the structural changes made.

Serious difficulties in fulfilling the planned assignments are arising at the main administration due to the shortage of welding-installation capacities. Solving this problem will make possible an increase in its own welding forces, which will provide the potential for further transition to complete comprehensive performance of the basic work by its own forces. For this purpose, welding and installation sections were formed in 1985 in the general construction administration of Sredazneftegazstroy Trust No 4. They are operating successfully. Similar sections are also being organized in the construction administration of the Mubaredgazpromstroy Trust No 6. The rates of increase in the welding-installation capacities depend primarily on the potentials for training its own highly skilled welding specialists. Training the personnel and expanding housing construction will contribute to securing high skills in our installation collectives.

12151
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PIPELINE CONSTRUCTION

UDC 621.643/553.002.2(574.1)

CASPIAN OIL, GAS COMPLEX DISCUSSED

Moscow STROITELSTVO TRUBOPROVODOV in Russian No 2, Feb 86 pp 27-28

[Article by M.Kh. Khusnutdinov, deputy minister of USSR Ministry of Construction of Petroleum and Gas Industry Enterprises, under the rubric, "Perspectives, Problems and Tasks": "Problems of Forming the New Caspian Oil and Gas Complex"]

[Text] Along with the further development of the Western Siberian oil and gas region--the country's main fuel-energy base--in the 12th Five-Year Plan a complex will be developed in the Caspian area for extraction of oil, gas and gas condensate and for the production of the products of hydrocarbon raw material refining.

The building up of this region of our country began just a few years ago. The first capacities for oil extraction at the Zhanazhol deposit, and for extraction of gas and gas condensate at the Karachaganak deposit were introduced here, and a great deal of work was done to build up the oil fields at Mangyshlak.

The deposits of this zone are of great value for the country's national economy. Oil, gas and condensate contain a mass of accompanying elements such as sulfur--an extremely necessary raw material for many sectors of industry.

Oil and gas processing plants, units for comprehensive preparation of oil, gas and condensate and hundreds of kilometers of pipelines will be constructed at the Caspian oil and gas complex.

A powerful production base for the construction industry is to be created here, equipment at existing enterprises located in adjacent regions is to be rebuilt and up-dated and new cities and workers' settlements are to be constructed.

Concentrating their efforts here, along with the Ministry of Construction of Petroleum and Gas Industry Enterprises, are collectives from the USSR Ministry of Industrial Construction, the Ministry of Transport Construction, USSR Ministry of Power and Electrification, USSR Ministry of Construction of Heavy Industry Enterprises, USSR Ministry of Installation and Special Construction Work and other ministries and departments.

The soils on the territory of the Caspian oil and gas complex deposits are strongly mineralized and the ground waters contain many sulfates, chlorides and caustic alkalies, corrosive to concretes and metals. Therefore, the development of deposits in this zone required that technological processes new in principle be developed for the extraction, processing and transporting of the valuable raw material, as well as the development of new types of equipment.

Large volumes of work are outlined for this region in the years of the 12th Five-Year Plan. The Ministry of the Petroleum Industry is to construct and put into operation in 1988 a set of projects for oil extraction at the Tengiz deposit, pressing and multiple pumping stations, oil preparation units, oil tanks, thousands of kilometers of field pipelines and power transmission lines. A water conduit Astrakhan-Mangyshlak and an oil pipeline Guryev-Astrakhan-Groznyy will be put into operation, work will be completed on the pipeline Prorva-Tengiz-Kulsary to transport gas, oil, drinking and industrial water and field and production bases for maintenance workers and construction workers, housing and social-cultural-everyday living facilities will be built.

Work on the first and second sections of the Astrakhan gas complex should be completed for the Ministry of the Gas Industry. The output of products and their delivery to consumers along the gas pipeline and products pipelines should thus be ensured. Construction of units for complete preparation of gas at the Karachaganak gas condensate deposit is being completed. The necessary communications lines to the Orenburg Gas Refinery will be laid here, as well as the main productline Orenburg-Salavat-Ufa, and production bases for operational and construction organizations and repair plants will be constructed. Construction of the Ural Gas Refinery will begin in the 12th Five-Year Plan.

Construction of its own base for the construction industry in this region will ensure the production of 410,000 m^3 of reinforced concrete structures, including about 100,000 M^2 of parts for large-panel house building. It is planned to put into operation plants to produce 30,000 m^3 of parts for large-block houses made of silicate concrete in the settlements of Kulsary and Kenkiyak in 1987.

Capacities should be developed to manufacture metal structures, block-boxes, brick, asphalt concrete, concrete mix and mortar in the years of the 12th Five-Year Plan. Not only must these enterprises be constructed, but the output at newly introduced capacities of about 300,000 m^3 of reinforced concrete, 6000 tons of metal structures and 1700 pieces of block-boxes must be ensured. Enterprises must be developed for the service and repair of building machines, mechanisms and motor vehicle transport, and work supply objects.

Solving the problems of opening up new deposits in such short periods is possible on the basis of wide use of advanced new technical designs and the great experience accumulated by our sector in the sphere of labor organization.

To solve the problems of surface object construction under the conditions of the extremely corrosive soil region (producing sulfate-magnesia-chloride

corrosion of concrete), VNIIST [All-Union Scientific Research Institute for the Construction of Trunk Pipelines] and the Experimental Design Office for Reinforced Concrete, in conjunction with NIIZhB [Scientific Research Institute of Concrete and Reinforced Concrete] are working on developing corrosion-resistant concretes which will use sulfur in their composition as a mineral binder instead of the traditional Portland cement. The question of using, for these purposes, polymer concrete and additives in the cement made of lime and copper sulfate, increasing the resistance of the reinforced concrete to the action of the hydrosulfidic ground waters, is being studied.

The use of frame-panel buildings, developed by the Experimental Design Office for Reinforced Concrete, will ensure a reduction of 20-30% on the average in the metal input as compared with the structures formerly used.

The use of precast structures and foundation mats will make it possible to reduce the labor-intensiveness of building foundations by 30%.

Developing permanent bases for welding and pipe insulation at the Tengiz and Karachaganak deposits will make it possible not only to reduce the labor input on the lines, but also to raise work quality. Widescale use of argon-arc welding of the base and filler layers of the joints of pipes 60-426 mm in diameter is specified under base conditions and on the line. Electric contact welding, eliminating subsequent thermal processing, will be used in field construction.

Using pipes made of high-strength steel will require the development of special welding technology. Research on using thin-walled pipes, welded by high-frequency currents, must be continued.

Problems of the thermal insulation of "hot" oil pipelines require an urgent solution. For this, work on introducing plant technology for applying thermal insulation made of urethane foam and a protective polyethylene covering on small-diameter pipes must be accelerated.

Using pipes made of corrosion-resistant polyethylene is a promising idea.

Large volumes of excavation and earth moving are to be done in sections with shifting sands. In this case the sand dunes must be smoothed out to the level of the depressions between the dunes with teams of bulldozers working by the group method.

At the sections of the line with sor, solonchak and takyr, temporary passages must be arranged, with the mound from the earthen roadbed spread out by means of bulldozers onto nonwoven synthetic material.

To secure the shifting sand dunes, they must be sown with marram seeds and protected against blowing away during the germination period by arranging a scrub shield and watering with a non-rosin compound. These and other measures connected with environmental protection should be decided comprehensively in the work plans and adhered to constantly by the executors.

The large program is to be carried out by creating and developing series production of equipment, tools and instruments capable of working in an environment containing up to 6% hydrogen sulfide and 25% carbon dioxide. These are shaped and sheet rolled metal for machine building and oil field construction, preheaters for thermal processing of pipe joints, machine tools for calibrating, and machining the ends of pipes 159-1420 mm in diameter for welding and units for automatic and argon-arc welding of pipes 60-426 mm in diameter.

Problems connected to developing pipe layers, on the basis of new industrial tractors, equipped with air purifying and conditioning devices, must be solved.

The amount of construction equipment supplied to develop the deposits of the Caspian oil and gas complex is sharply increasing. Therefore, in 1986-1989 Glavkazneftegazstroy must design and build in Aktyubinsk a plant for major repair of bulldozers, excavators and crane trucks, having specified in the plant's program the manufacture and reconditioning of building machine parts.

In this same period a plant should be put into operation in Aksay in Ural Oblast for major repair of the Tatra, KrAZ and MAZ motor vehicles, their engines and assemblies.

The assembly method of repair of construction machines at the sections created at the mechanization administrations to recondition worn out construction equipment parts should be further developed.

Also requiring a solution are the problems of maintaining and repairing the motor vehicle rolling stock and up-dating the motor fleet, technology and organization of motor transport in the Caspian region.

One of the chief problems solved by the Ministry of Construction of Petroleum and Gas Industry Enterprises in the Caspian oil and gas region is the formation of stable collectives for the organizations engaged in opening up new oil and gas deposits. With a view to attracting skilled personnel here, the ministry solved a number of problems on regulating the construction workers' wages. New tasks have been posed with respect to improving the practice of selecting and placing personnel and their business-like political training, so that all the subdivisions now at work and those newly formed here are completely made up of capable directors and specialists devoted to their work. Capable young people who have passed through their production tempering must be more actively promoted to the management of the organizations.

To solve the problem of securing personnel in the region, in addition to constructing major housing in the cities and the workers' settlements, it is particularly important to develop a mobile social infrastructure--field and line cities for construction workers, with complexes of every-day service facilities, adapted to the specific climatic conditions of the region--the high absolute temperatures of the air, increased insolation and dust.

The sector's educational and production base must be strengthened and expanded to improve the quality of the traning and ensure a regular rise in the skills

of the workers. There are plans to put the leading educational course combine of Glavkazneftegazstroy into operation at Aktyubinsk and to create a network of educational centers at the trusts in 1987-1988.

Measures have been worked out which specify the construction of dining halls, stores, warehouses and refrigerators on the territory of the Caspian oil and gas complex.

Additional measures are outlined for further improvement in the operations-dispatch communications for the construction projects of the Caspian oil and gas complex. Wide use will be made here of microprocessor equipment and computers. In conjunction with the Ministry of Communications, the Ministry of the Gas Industry and the Ministry of the Petroleum Industry, solutions are being found to problems of leasing telephone lines and providing the subdivisions with mobile radio stations, radio installation for the region and reception of Central Television broadcasts.

Work on developing the Caspian oil and gas complex is picking up speed. A successful solution to this difficult, but honorable assignment of the party and the government requires the coordinated work of the sector's subdivisions and the ministry apparatus and close interaction with the local party, soviet and economic organs.

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PIPELINE CONSTRUCTION

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COMPRESSOR STATION CONSTRUCTION REVIEWED

Moscow STROITELSTVO TRUBOPROVODOV in Russian No 2 Feb 86 pp 44-45

[Article by S.A. Volkov, Orgtekhstroy Trust of Glavtatneftegazstroy, Almetyevsk: "Construction of a Model Compressor Station"]

[Text] The Pomarskaya compressor station KS-22 on the Yamburg-Yelets-I gas pipeline is one of 15 model construction projects in the country. The KS plan (developed by Giprospetsgaz) species a unified block-unit variant and equipment with eight gas pumping full-pressure units powered by an electric motor type STD-12500.

KS-22 should be put into operation in June 1986. The general contractor is the construction and installation trust No 7 of Glavtatneftegazstroy. The Orgtekhstroy Trust of Glavtatneftegazstroy, in conjunction with VNIIPKtekhorgneftegazstroy [probably--All-Union Scientific Research, Planning and Design Institute for Technological Organization of Petroleum and Gas Construction] worked out the organizational-technological documentation. The work production plan (PPR) specifies the use of the technology of rapid construction, based on the combined-flow method.

All the main objects at the station were broken down into checking devices to ensure parallel performance of the construction and installation work (SMR) by several flows. This system requires high technological discipline and strict adherence to the sequence of carrying out the SMR. This means: the active participation of the purchaser, in advance of the supply of technological equipment, and prompt presentation of the work front to the subcontracting organizations and rapid turn-around of the forces.

Along with representatives of the purchasers, the planning institute and the contractors, workers from the Orgtekhstroy Trust and the Computer Information Center were on the construction staff.

The "Provisional Regulations on Authorial Supervision of Introducing PPR" which was drawn up fixes the rights and duties of the developing organization to ensure adherence to the plan. This is important for rendering assistance in solving problems of engineering facilities, technical substantiation for variants and change in the technology and work organization. The right to

issue instructions on work technology, rules of storage, labor safety practices, etc., etc., right up to requiring that work be stopped before fulfillment of the observations of the authorial supervision is reserved for the developer-organizations.

A large place in PPR is devoted to analysis of the design and structural decisions of the plan from the standpoint of the technological qualities of the SMR. A number of changes were proposed and agreed upon with the planning institute: replacing monolithic structures with precast, using structural designs for foundations that correspond to the local geological conditions and possibilities of the contractor.

The structure of the most labor-intensive FO-1 foundation under units was changed. It was proposed that it be made in a precast reinforced concrete slip form. The slip form is assembled from standard reinforced concrete sheets and in it is placed a reinforced framework under a spreading of concrete. This makes it possible to eliminate multiwork operations and to begin work on building the underground facilities practically immediately after the slip is set up. As a result, the total period of work on the compressor shop--the most labor-intensive object at the station--is reduced.

Foundations under the gas AVO [air cooling unit] made of monolithic reinforced concrete were replaced by pile foundations with a metal foundation mat, a precast monolithic variant of foundations was used instead of monolithic under the 3RU-10 kw reactor, using reinforced concrete rings 1500 mm in diameter, precast reinforced concrete column footings under the framework of the compressor shop and a precast variant of the cable conduits were introduced, etc. Some communication lines were brought to the surface.

Systems of pile fields with routes for the movement of the pile-driving units, a schedule for delivering and driving the piles, technological systems for the work, measures to ensure safe labor conditions and operational quality control were worked out in PPR to drive the piles.

Using three pile-driving units made it possible to develop work quickly throughout the entire compressor station. In consideration of the experience in constructing the preceding sections, great attention was paid in the plans to work on the compressor shop, gas connections of the pumps, gas AVO, dust catchers and ZRU-10 kw. Work is to be done on the engineering networks until the start of the main construction and installation work. Methods are determined in the PPR to perform work under the conditions of a high ground water level. A water drawdown was carried out during the period of engineering preparation and in planning the locality surface water drainage was carried out.

The production technology allows for the fact that the main construction period falls in the winter months, when the earth and concrete work are substantially more complicated. According to the experience of the preceding sections, a heated concrete mixture is used in pouring the foundations. The use of thermoactive, flexible coverings is specified. A test batch of this was prepared by the Orgtekhstroy Trust and was tested under production conditions.

Powerful load-lifting equipment is used in the installation of buildings and technological equipment. The problem of its safe operation has been worked out. For example, the wall panels are installed "as a packet" for which a special stand has been introduced. As a whole, maximum preliminary consolidation of the elements and efficient storage of the structures is specified in installation.

The compressor station has a ramified network of underground communications lines. In order not to damage the pipes previously laid, the PPR workers used the mock-up method. The mock-up gives the spatial orientation of the communications lines. It ensures selection of the most efficient methods of doing the work, incorporated in the plan, and also makes it possible to expedite efficient decisions under the conditions of the site.

Since the basic structures--dust catcher, compressor shop and gas air cooling units--are rigidly connected with the system of technological large-diameter pipelines, particular attention is paid to the accuracy of geodesic plotting and geodesic monitoring. The production plan for geodesic work (PPGR), along with traditional geodesic instruments, proposes using lasers, which ensure great accuracy of the measurements, with high labor productivity.

A system of quality control, which is a complex of organizational, scientific-technical, ideological-educational and economic-legal measures, contributes to successfully carrying out the model construction. The system assumes the formation of a series of standards setting the norm for all stages of construction at the compressor station, and taking into account the factors affecting the quality. Nor is the "human factor" set aside. The central unit of the system is the functioning, under the conditions of the construction site, of a quality laboratory, which was assigned to the general contracting trust especially for the model construction project.

A TAP-34 minicomputer is used to raise administrative labor productivity; its purpose is the storage, processing and efficient output of information. The AIS-line was adopted as the basis of the systemic software.

The Orgtekhstroy Trust is now engaged in broadening the mathematical apparatus in order to ensure the transition to automation of administrative functions such as drawing up and correcting the work schedules, compiling the weekly-daily assignments by executors, selecting reference information, monitoring the complete equipment of an object, etc. Training and procedure for examinations on the knowledge of the workers and engineering and technical personnel of the rules of labor safety techniques is planned on a minicomputer, using a set of programs worked out by the trust.

The trust began experimental work on developing video-information systems long ago. Domestic production videotape recorders are used for this. At the model construction project the trust intends to show the elements of this system which can be regarded as components of future visual information systems.

The Orgtekhstroy Trust worked out recommendations for reconstruction of the residential settlement serving the compressor station construction. It took into account the fact that the construction workers spend considerable time in the settlement and that for many it has become essentially a permanent place of residence.

In addition to PPR developers, specialists in computer equipment, quality and labor safety techniques, instructors in the introduction of advanced labor methods and geodesists, artists, journalists and photographers also serve the model construction project. Their task includes efficiently covering the course of socialist competition at the project, the state of the construction and preparing information for propaganda on the advanced experience and the achievements of innovators.

It was necessary to draw regional science to the work. A study is being made by scientists of the Kazan Construction-Engineering Institute on the subject, "Increasing the Reliability of Compressor Station Flow Construction Organization," which, in our opinion, is particularly important for the construction of compressor stations in a single corridor.

The Orgtekhstroy Trust has put all its efforts into fulfilling the task of engineering provision for the model construction.

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RELATED EQUIPMENT

UDC 622.692.4

BITUMEN-FILLED POLYETHYLENE DRUMS MOVED BY PRODUCT PIPELINE

Moscow NEFTYANOYE KHOZYAYSTVO in Russian No 8, Aug 86 pp 49-54

[Article by M. E. Shvarts (of the Special Design Bureau of Transnefteavtomatika): "Container Transport in a Petroleum-Product Pipeline and the Effect of Container-Shell Wear on the Product Being Pumped"]

[Text] Hydraulic pipeline transport of containers (KTGT) is a new area in the development of pipeline transport. Introducing it will enable the variety of freight transported over trunk pipelines in container shells within a liquid stream to be expanded. This in turn will pave the way for reducing the number of haulages of such loads by rail and other types of transport. KTGT presents real opportunities for the effective utilization of underloaded or unused pipelines, whose numbers are rising because of the depletion of some oil and gas fields.

The development of KTGT based upon petroleum-product pipelines enables an unambiguous answer, founded upon factual data that has been obtained, to the question of the desirability (because of the construction of numerous outlets at filling points, bulk plants and filling stations) of continuing to erect and operate trunk petroleum-product pipelines of great length, and the question of the potential for providing them with a full load.

The scientific and technical foundations have been laid for transporting in container shells all petroleum freight and various kinds of industrial freight and various kinds of industrial freight. However, further development of all pipeline transport and of KTGT in particular is possible if all trunk pipelines are subordinated to one agency. Such organization will make possible flexible operation of pipelines, the rational use of existing equipment, a great reduction in manning by operating personnel and a rise in their qualifications, the rapid introduction of new types of pipeline equipment and instruments, including computers, and improvement in industrial processes during the transfer pumping of hydrocarbon raw materials and petroleum product. Only under centralized organization of trunk pipeline transport will the actual potential for creating industrial KTGR systems appear. Such systems, which unite the components and elements that are located at various facilities and enterprises but are mutually related in a single operating process, will be the basis for hydraulic pipeline transport of containers.

One of the chief problems that is characteristic of industrial KTGT systems is the effect of wear of the polymer container shells on the quality of the

light petroleum product being pumped. This article examines the question of the effect of polyethylene crumb on the quality of diesel fuel, within a stream of which container shells filled with high-melting point bitumen are moved. Study of this is one of the most important component parts of multiple-plan research that was carried out during creation of an experimental Kirishi-Leningrad system, which was based upon the like-named operating petroleum-product trunk pipeline.

Unlike oil pipelines, there is no lubricating layer of paraffin on the inner surface of petroleum-product pipelines. Wear of containers within them occurs more intensely during contact with the pipes' coarse surface. Because of this, variants of a basic design for polyethylene container shells were developed, which consist of a cylindrical shell with 12 longitudinal runner-ribs and a lid.

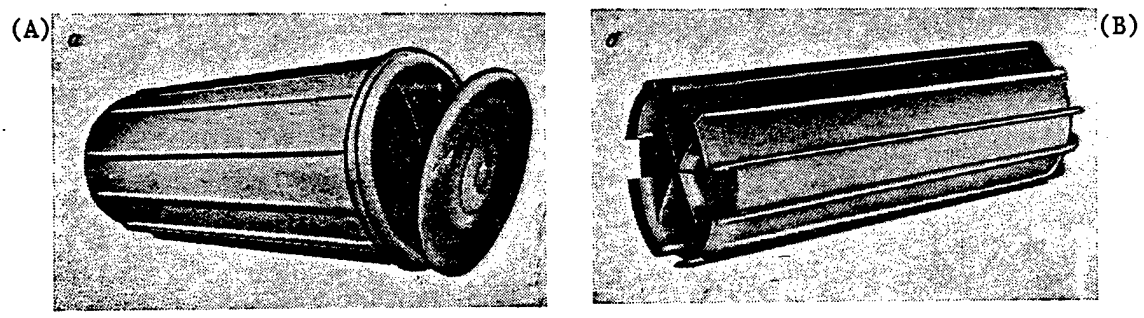

Figure 1. Polyethylene Containers: (A) Cast, and (Б) welded

Two types of polyethylene containers were used in the industrial-test KTGT system while working out an operating practice: cast and welded (figure 1). Their specifications are cited below:

	The cast container	The welded container
Length, mm	585	725
Diameter, mm:		
of the base, at the place where the lid is fastened	275	255
of the main body	220	255
Weight, grams:		
of the assembled container:		
sealed	1,700	2,900
unsealed	1,080	--
of the lid	125	300
Number of longitudinal ribs	12	12
Height of the ribs, mm:		
initial	13	10
terminal	10	10
Thickness of the body's shell, mm	5	5
Capacity, liters	22.75	28.95

Production of the cast containers for use in petroleum-product pipelines 300 mm in diameter was organized at a Mosstroyplastmass Production Association enterprise. The results of research of the motion dynamics of such containers

in a stream of liquid being pumped have indicated that, as the flow velocity increases, the container's speed rises. It becomes a component part of the stream and less wear of it is observed.

Experimental studies carried out on a special pipeline bench at MING established that, for a stable position of bitumen containers whose density is 1.15 that of the pumped liquid (diesel fuel), the rate of flow in the Kirishi-Leningrad petroleum-product pipeline should exceed 1.5 meters/second. However, under actual conditions, when the maximum flow speed is no more than 1.2 m/s, the average velocity of the container shells with bitumen will be 1.1 m/s. At this flow speed, container wear occurs in the lower nose portion of the body's shell, the area of which is limited by the four runner-ribs, in a plane that is located at an angle to the pipe's axis. The angle of inclination for the cast containers averaged 5 degrees, the welded ones 4 degress, that is, it depends upon the length of the containers. This testifies to the fact that the containers travel with a trim. Such motion was confirmed in experiments performed by V. K. Lipskiy and I. N. Troitskiy in a glass pipeline in which container motion in the Kirishi-Leningrad pipeline was simulated.

Determination of the reliability of the polyethylene containers in an actual petroleum-product pipeline was of great importance in the tests conducted. For this purpose, 160 cast and 9 welded polyethylene containers filled with water-insulating and construction grades of bitumen were transmitted on the Kirishi-Leningrad petroleum-product pipeline. The containers were inserted in batches (3 or 4) without a cessation of pumping. In order to introduce them into the petroleum-product pipeline and receive them from it later, specially developed devices were used (figure 2) that are described in work [1]. One-hundred forty-three of the 169 containers that were sent over the petroleum-product pipeline arrived through the receiving installations, the rest arrived in the chamber that receives the ball dividers and the pigs. The results of the full-scale tests of the polyethylene containers for reliability follows.

	Cast containers	Welded containers
Number of containers:		
transmitted	160	9
received	160	9
undamaged	122	6
destroyed	1	---
damaged	37	3
with open lid and body chafed all the way through	15	---
with open lid but the body whole	12	---
with body chafed all the way through.	10	3

Let us explain the results. In the initial stage of the industrial experiments, 27 of the containers sent over the petroleum-product pipeline were damaged at the juncture of the lid and the body. The basic cause for this was the fact that, after the bitumen in the closed container had cooled, a rarefaction space formed under the lid. After the container was introduced into the petroleum-product pipeline, where the pressure was fairly high, the juncture of the lid with the container's body was destroyed. In order to

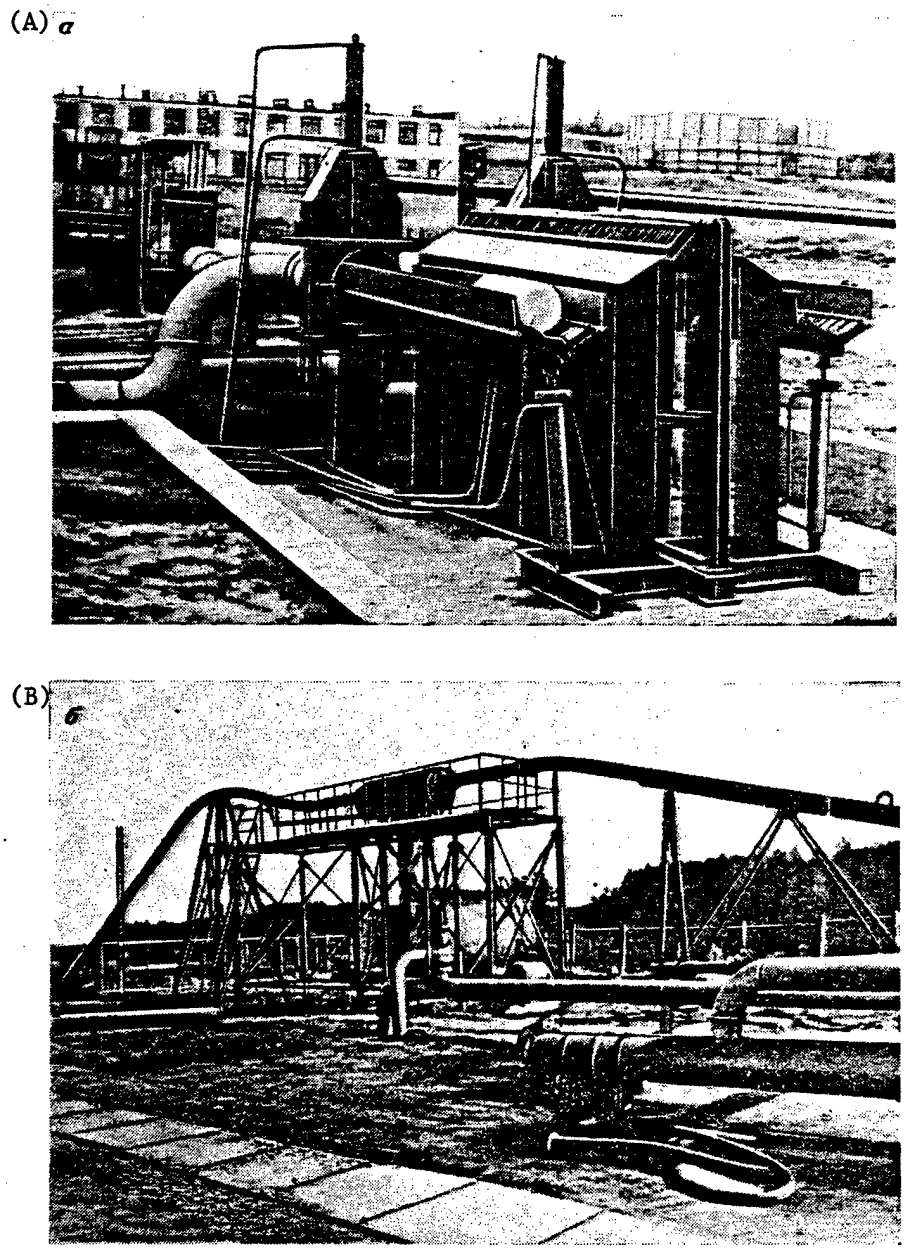

Figure 2. Installations for (A) introducing containers into the petroleum-product pipeline, and (B) for receiving them from the pipeline.

preclude this phenomenon it was sufficient to make a tiny hole in the lid. This simple method ensured the integrity of the remaining 122 containers.

Where the average flow velocity was 1.2 m/s, the average velocity of the containers of bitumen was less. They more frequently touched the pipe's lower generatrix and, as a result, much wear occurred. This, plus the presence

of a trim during container motion, explain the cause of the wear on the lower nose portion of the bodies of 25 of the containers. Since the flow velocity could not be increased, the height of the rib, at least in the leading portion of the body, had to be raised 3-5 mm in order to avoid damage to the container bodies when they touched the pipe. The table cites the date of the industrial tests for wear resistance of the polyethylene containers.

Indicators	Cast containers				Welded containers		
	Industrial experiment No.						
	1	2	3	4	5	6	7
Weight of the container with bitumen, kg:							
Prior to transmission..	25.5	25.5	26.1	25.5	26.12	26.00	26.10
After transmission.....	25.3	25.4	25.4	25.4	25.84	25.70	25.80
Relative density of the container with bitumen.....	1.27	1.28	1.30	1.27	1.28	1.27	1.28
Relative cross-section area....	0.91	0.91	0.91	0.91	0.82	0.82	0.82
Ratio of model length to pipeline diameter.....	1.96	1.96	1.96	1.96	2.43	2.43	2.43
Velocity, meters/second:							
of the flow of the liquid..	1.2	1.2	1.2	1.21	1.2	1.2	1.19
of the container with bitumen.....	1.1	1.1	1.1	1.1	0.99	1.1	0.99

The average wear of the cast container was 150 grams, the welded ones 170 grams. Full-scale experiments that were conducted indicated that if the containers constantly came in contact with the pipe's coarse surface, the wear would be incommensurably greater, and so the containers' integrity would not be ensured. Apparently, the containers did not come in contact with the pipe over a major portion of the route.

Moreover, it was established that the wear of the body shell of the polyethylene containers with longitudinal ribs 15-18 mm high did not reach a critical value. In considering the average wear of the cast polyethylene containers and supposing that 1.36 million containers with bitumen, each with a capacity of 25 liters, can be sent over the petroleum-product pipeline in a stream of diesel fuel in a year, we assume that the polyethylene concentration in the carrying stream of diesel fuel is 1.13 g/kg. The product of container wear is polyethylene chip.

The chip content in the diesel fuel raises a question about the effect of the polyethylene on the quality of this petroleum product. In order to resolve this question, samples of the diesel fuel taken from the petroleum-product pipeline and the polyethylene chip which it contained in the form of ground-up polyethylene crumb in the indicated concentration were studied. The results of the studies testified that the polyethylene crumb was not dissolved after spending 50 hours in the diesel fuel, and its swelling did not exceed 7 percent. Consequently, the possible wear of the polyethylene containers had practically no effect on the diesel fuel's quality.

Similar data were obtained after tests of such samples of diesel fuel by TsNIDI [Central Diesel Scientific-Research Institute]. It was established

that the physical and chemical characteristics of the diesel fuel met the All-Union State Standard 305-82.

The polyethylene chip formed in the petroleum-product pipeline can be removed with filters. Falling into the tanks together with the diesel fuel, it settles as a sediment. If the number of bitumen-loaded containers per year indicated above are sent over the petroleum-product pipeline, then the total amount of polyethylene crumb probably will be about 200 tons. Studies have indicated that the polyethylene containers and the chip obtained can be used as an additive to the bitumen.

Work performed by Novopolotsk Polytechnical Institute staff workers with our collaboration, and also MING's Department of the Technology for Refining Oil and Gas, under the supervision of Z. I. Syunyaev, and the Section for Water-Insulating Materials of VNIIgidrotekhnika established that, with an average (3 percent) content of low-pressure high-density polyethylene by weight of the bitumen, a bituminous polymeric composition is obtained which is much better in its operational qualities than the high-melting point BN-Ч-IV and BN-Ч-V bitumen.

Yu. I. Samchenko's special installation, a description of which is given in works [2 and 3], should be used for melting the polyethylene containers and the polyethylene chip with the bitumen.

The results of operation of the Kirishi-Leningrad KTGT industrial test system proved the desirability of transporting bitumen in polyethylene containers. This outcome points to the possibility of transporting petroleum freight and various industrial freight in polyethylene containers in a stream of light petroleum product, which, in turn, will enable the amount thereof shipped by rail and other types of transport to be reduced.

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GENERAL

FUEL COMPLEX DEVELOPMENT IN 12TH FIVE-YEAR PLAN

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[Article by A. Lalayants, deputy chairman of USSR Gosplan: "The Country's Fuel-Energy Complex in the 12th Five-Year Plan"]

[Text] The 27th Congress of the Communist Party of the Soviet Union adopted a course of strategy to accelerate the country's socioeconomic development. The Political Report of the CPSU Central Committee noted that acceleration means "primarily increasing the pace of economic growth. But not just that. In essence it is a new quality of growth in: the overall intensification of production on the base of scientific and technical progress, the structural reordering of the economy, and effective forms of managing, organizing, and stimulating labor". (Footnote 1) ("Materials of the 27th CPSU Congress", Moscow, Politizdat, 1986, p. 21)

The fuel-energy complex has an important role to play in converting the national economy to the path of intensive development. Its impact is achieved by two basic approaches: improving the functional efficiency of the fuel-energy complex itself, and as a result of the effect of the complex's output, especially electric power, its impact on other sectors. It is called on to ensure that the national economy's demands for all types of fuel and energy will be reliably met, while systematically carrying out a vigorous and purposeful energy saving policy. One of the decisive sources for meeting the growing demand for fuel and electric power, as noted at the June (1986) Plenum of the CPSU Central Committee, is the more rational consumption of them.

The USSR has a quite diversified raw material base, which has made it possible to set up a powerful and highly effective fuel-energy complex. As a result of its operations the national economy obtained in 1985 595 million tons of oil (including gas condensate), 643 billion m^3 of natural gas, 726 million tons of coal, and 1,545 billion kWh of electric power. Our country holds the first place in the world for the output of oil and gas. The total energy resources extracted or produced in 1985 amounted to 2.2 billion tons of standard fuel, which is about 20 percent of the world's production of energy resources.

The Soviet Union has set up a unique system for electric and gas supply. The Unified Electric Power System (YeESS) encompasses a territory of more than 220 million people and about 90 percent of the country's total electric power

output. There are now operating in a unified system within YeESS more than 700 major power plants with a rated capacity of more than 250 million kW, i.e., nearly 85 percent of the capacity of all the country's power plants. The unified gas supply system unites several hundred gas fields and includes approximately 160,000 km of main pipelines, about 350 compressor stations, and more than 270 oil field installations for comprehensive gas treatment, which have several thousand connected wells and dozens of underground reservoirs. The unified gas supply system furnishes gas to more than 5,000 cities and urban-type settlements and more than 165,000 populated rural places. The gas system (including compressed gas) encompasses about 80 percent of the country's populace.

The growth in energy potential has made it possible for the country's industrial enterprises to adopt mechanized and automated continuous-flow lines, and to set up comprehensively mechanized and automated sections, shops, and plants. As a result, the amount of power and energy supplied to industrial labor increased between 1971 and 1985 by a factor of more than 1.5, and in turn was a major factor in the growth of labor productivity by a factor of 1.8 in this leading sector of the national economy. In agriculture these indicators for this period increased by 4.2 and 2.5, respectively, which made it possible to convert agriculture to a qualitatively new technical level.

The role of electric power has also been great in the development of other sectors of the national economy. For example, the work of electrifying the railroads is being vigorously pursued. It has now been extended to nearly 50,000 km, or about 35 percent of the country's total operating rail lines (this is more than the United States, France, West Germany, Italy, Great Britain, and Japan put together). The conversion to electric traction has made it possible to reduce the consumption of light oil products in 1985 by 1.5 million tons, and by 1990 this reduction will amount to 5 million tons. Rail loading and unloading operations have been comprehensively mechanized to a high degree (on the order of 95 percent). In construction the amount of machinery supplied to labor has tripled in comparison with 1970, and the amount of energy has increased by a factor of more than 1.5, which has been one of the decisive factors in the intensification of production and of growth in labor productivity.

Research carried out at the Scientific Council for Complex Problems of Power (of AN [Academy of Sciences] USSR) has shown that, thanks to growth in the amount of energy supplied to labor, there has been a 50 percent overall increase in the productivity of social labor.

While giving much to the national economy, the fuel-energy complex also takes a great deal of its material, labor, and financial resources. Its share is about 20 percent of the country's investment in the national economy (industry's share is 35 percent). Concentrated here is 27 percent of industry's fixed production capital. The sectors of the complex have more than 2.5 million industrial-production personnel. And the indicators of the effectiveness of the entire national economy are heavily dependent on just how the complex utilizes these resources and on what their output is.

It must be said straight out that the trends that have developed in the dynamics of the basic economic indicators of the development of the fuel-energy complex are not satisfactory. In particular, the total and relative investments in the development of the country's fuel-energy complex have grown constantly, and unfortunately at quite high rates, especially for oil production. It is anticipated that in the next 15 years investment in this area will increase by approximately a factor of 1.9, while the volume of extraction and production of primary fuel-energy resources will increase by only a factor of 1.5. Furthermore, the capital-output ratio in all sectors of the complex is falling. For example, from 1970 to 1985 the capital-output ratio for electric power decreased by 22 percent (from 38 to 30 kopecks per ruble), and by 52 percent in the fuel industry (from 119 to 57 kopecks per ruble), including a 64 percent drop in the oil producing industry. Along with growth in investment and decrease in capital-output ratio there has been an increase in the production costs of fuel-energy resources. In the period 1971-1985 the cost of producing oil increased by a factor of 2.8, of natural gas by 3.8, of coal by 1.6, and of electric power (useful output) by 1.3. The complex as a whole has also had a slowdown in rate of growth, and in the oil production industry there has even been a decline in the level of labor productivity.

I would especially like to mention the problem of the decline in product quality in several sectors of the complex. For example, according to the USSR Ministry of the Coal Industry, in the period from 1970 to 1985 the ash content of coal increased from 22.6 percent to 26.7 percent. In practice this means that the useful exploitation of the sector's actual potential end product declined by about 4.1 percent (or by 25-30 million tons of coal annually). A considerable reduction in the quality of electric power has been going on for some time. In 1984, for example, the USSR Unified Electric Power System was operating at reduced frequency for about 72 percent of the calendar year, which caused great economic losses to the national economy. Improvement in the sector's state of affairs in 1985 made it possible to bring the frequency up to standard (50 Hz) last winter, which produced an effect of about two billion rubles for the national economy.

There are many reasons for the negative aspects in the development of the fuel-energy complex and its sectors. Some of them are objective reasons: deterioration in the mining-geological conditions for extracting fuel and depletion of its most economical and accessible resources in the main fuel-producing areas, relocation of fuel-producing centers to undeveloped areas with harsh weather-climatic conditions, etc. But this is not the whole story. Many of the reasons are subjective and due to shortcomings in scientific and technical, production, and economic planning activities, especially in pricing.

But even the negative impact of the objective causes could be sharply reduced if combatted in full measure by contemporary advances in science, technology, and the organization of social production. This is confirmed by the work results of the complex's sectors in the first quarter of 1986, when measures adopted in the coal, oil, and electric power industry not only achieved a growth of output against the preceding period, but even improved the most important operating indicators, such as growth in labor productivity,

improvement in product quality, decrease in production cost, etc., against the indicators established in the plan.

The role of the energy factor in the solution of economic and social problems is currently growing more and more, and therefore the production and consumption of energy resources and the associated national economic costs have reached an enormous size and will grow even larger. In this connection further efforts are required from the collectives of the sectors of the fuel-energy complex aimed not only at securing high levels of fuel extraction and energy production, but also a sharp change in the dynamics of the quality indicators of development, as required by the decisions of the party's 27th Congress. We must overcome the negative trends in the technical and economic development of the complex, which developed for various reasons in the past. This is no easy task, and is related to the solution of many technical, economic, and social problems.

The 12th Five-Year Plan provides for further growth in the extraction and production of energy resources, while systematically carrying out a purposeful energy-saving program in all sectors and spheres of the national economy. The output of gas is to increase by 30-32 percent, of coal by 10 percent, and of oil by 5-7.5 percent. Electric power generation at AES and GES will reach 535 billion kWh in 1990 (as against 381 billion in 1985), and its share in the total generation of electric power will amount to 29 percent, and in the structure of all primary fuel-energy resources to 7.5 percent. Provision has also been made for considerable improvement in the operating quality indicators of the fuel-energy complex and its sectors.

When we realistically evaluate the conditions and indicators for the fuel-energy complex provided for in the 12th Five-Year Plan and the longer term, it is not hard to imagine how great are the tasks and problems to be solved in the section on developing and improving the effectiveness of its productive potential.

To solve the problems envisaged in the 12th Five-Year Plan, we must first of all expand and strengthen the raw material base of the fuel-energy complex by intensifying geological exploration for oil and natural gas in Western and Eastern Siberia, in the Caspian Depression, in the European part of the country, in Central Asia, and in the Far East, and also for coal, especially for mining it by the open pit method. This requires not only an expansion of geological exploration operations, but also a considerable improvement in their scientific and technical level and in their effectiveness. This is important primarily for areas that are difficult from the standpoint of geological exploration, such as the Caspian Basin, Eastern Siberia, and Western Siberia (the Paleozoic deposits). Science must provide well founded and practical proposals as to when and how most rationally to develop specific promising areas for oil or gas and what effect to anticipate from their exploitation, and also to determine possible alternative solutions.

Methods must be rapidly improved for the economic evaluation of fields, including the comprehensive estimate of all the proven useful components they contain. This approach is essential, for example, in evaluating the

comparative economic effectiveness of fields in the Caspian Depression (where, along with oil and natural gas, there will be a large yield of gas condensate, of natural sulfur, which incidentally will make it possible to reduce imports of it, and of other components), and in evaluating new, non-traditional, and renewable energy sources.

Much work remains to be done in the sectors of the fuel industry. It is planned to continue development of the production of oil, gas condensate, and gas in Western Siberia, the Kazakh SSR, the northern European part of the country, and other areas, to start the commercial exploitation of the deep-seated oil fields in the Caspian Depression, to accelerate the development of gas-oil fields on the continental shelf, to adopt more effective methods of producing oil that will increase the oil recovery from formations and the intensification of their development, to further intensify oil refining and increase the output of motor fuels, to increase the level of recovery of gas condensate and other valuable components, especially the utilization of petroleum gases, and to expand the network of underground reservoirs. Provision has also been made to accelerate the open-pit development of the highly effective coal fields of Kuznetsk, Ekibastuz, Kansk-Achinsk, and other basins of Eastern Siberia and the Far East. The technical reequipping of the Donbass will continue, as will the general quality improvement of coal from the employment of more improved technology and machinery and from increased processing of it.

It is planned in the 12th Five-Year Plan to sharply increase the productive potential of electric power by constructing major nuclear power plants in the European part of the country and condensation thermal power plants with a unit capacity of 4-6 kW or more and hydroelectric power plants in the eastern regions. The sector must carry out a broad program to modernize existing equipment and to replace what is outmoded. Efforts must be continued to put together and improve the country's Unified Electric Power and Gas Supply System.

Along with developing the extraction and production of fuel and energy, all sectors of the national economy are to accomplish an array of measures to reduce losses and to increase the effectiveness of utilizing energy resources.

All this is far from being a complete enumeration of work to be done to reliably supply the demand of the national economy for fuel and energy, and it must all be performed with minimum costs in social labor and at a rapid pace. In practice this can be done only by accelerating the introduction of advances in scientific and technical progress, pursuing a purposeful structural and investment policy, and improving the economic mechanism, all of which in combination are the major factors for intensifying and increasing the national economic effectiveness of the productive potential of the fuel-energy complex.

The acceleration of scientific and technical progress in the fuel-energy sectors, while highly intensive in capital and labor, is of special importance, because it can cancel out the negative impact on the sectors' economy of deteriorating mining-geological and weather-climatic conditions of production and of other factors that increase costs. It is particularly necessary now to

solve such urgent problems as:

comprehensive reequipping and reconstruction of the fuel-energy industry;

improving the effectiveness of recovering oil from the earth and of utilizing it, including replacing it with other less scarce energy resources;

improving the effectiveness and the scope of utilization of natural gas and its various fractions;

reducing the cost and considerably expanding the area of employment of nuclear power, including the conversion to fast-neutron reactors, the construction of nuclear heating plants, and other measures;

reducing losses and expenditures in the production, transport, and processing of primary energy resources;

improving the quality of energy resources delivered for end use;

radically improving the effectiveness and sharply reducing the labor intensiveness of underground coal mining by the comprehensive mechanization and automation of production;

developing shallow and gently sloping formations, and the whole gamut of steeply sloping formations;

improving the effectiveness of geological exploration, especially for oil and gas;

on the base of geophysical methods setting up and utilizing new integrated systems of geological exploration to achieve a sharp reduction in the proportion of dry wells explored and to determine the effectiveness of wells;

extensively involving in the national economy non-traditional and renewable energy sources, as well as sources little used at present, such as minor rivers.

There must be priority targetting of investment policy in order to accelerate a solution to these problems that will lead to a qualitative transformation of the material-technical base of the fuel-energy complex. Of course, much has already been done in this area. Definite practical results have been attained, both in improving the equipment and technology of production and improving certain of its technical-economic indicators. However, the implementation of advances in scientific and technical progress has so far been slow in the sectors of the complex, and have not produced the effect that is potentially attainable.

A serious drawback that hinders the expansion of the area of employing new equipment and improving its utilization is in many cases the high cost of it, which is not proportional to the effect obtained, thus causing an increase in the capital intensity of production and (after amortization) an increase in production cost. In the coal industry, for example, the cost of outfitting a long wall with mechanized equipment has increased by a factor of 5 to 10 when compared with the simpler technical devices previously used, while the output of coal (under comparable conditions) increased by a factor of only 2 or 3, and the labor productivity of a man employed at the working face was wholly insignificant.

Often scientific and technical measures that are effective in principle (and considerable funds are expended on implementing these) are not carried out in an integrated way but involve only certain links of a single technological chain. As a result, because other bottlenecks exist (or crop up) in the

chain, the actual effect from using them is sharply reduced. In the coal industry, because of the inadequate profile and unsatisfactory status of the mine drifts, the delivery of goods, and especially of material, is poorly mechanized, which puts a brake on improvement of the entire technological process of mining coal with the use of mechanized systems. Because of the shortage of means of small-scale mechanization there is still much use of manual labor. In the oil and gas industry automation is lagging of the processes of producing and transporting oil and gas, and of other processes. In the electric power industry the problems of automating production processes, including repairs, are far from being solved comprehensively. This major deficiency (lack of integration of measures) in the technology and organization of production development in the sectors of the fuel-energy complex must be eliminated in short order, and is the very first condition for solving the tasks of technical progress assigned by the 27th CPSU Congress.

Along with this, the development of new equipment must not lag behind the actually evolving conditions under which the enterprises of the fuel-energy sectors have to operate. Specifically, problems when developing the oil and gas fields of the North arose mainly because of delays in solving regional problems of transport, energy supply, automation of the processes of producing and transporting oil and gas, and insufficient reliability of machinery and materials employed. From a technical standpoint the coal industry proved to be unprepared to integrate the mechanization of working face operations in shallow formations, the number of which in underground coal mining has recently sharply increased. As a result, equipment is often employed in them that was intended for thicker formations, and the coal dug includes wall rock, which clutters up the coal with rock and causes additional useless work.

The solution to these problems of the fuel-energy complex is heavily dependent on allied sectors. The machine-building, chemical, metallurgical, and other sectors must fully meet the requirements of the fuel and power industry for efficient equipment, machinery, and materials in the light of their new and more difficult operating conditions (for example, in the Caspian region, on sea shelves, at great depths in the traditional coal basins, etc.).

This in turn calls for restructuring allied sectors on the basis of their technical reequipping and further specialization, improving the structure and quality of construction materials, and improving design efforts. In other words, their technical base must also be raised (as provided for in the USSR's Energy Program and the Program for Technical Progress in the 12th Five-Year Plan and up to the Year 2000) to the level of the difficult tasks confronting the fuel-energy complex.

In the first place everything must be done to reduce purchases in capitalist countries of equipment, machinery, and materials for the fuel producing sectors, especially pipe, chemicals, and equipment for the oil and gas industry. In this connection there must be further development of ferrous metallurgy (mainly of capacity to produce oil-grade and pipeline-grade pipe) and non-ferrous metallurgy, power machinery, instrument making, and other sectors of industry to supply nuclear power plants with equipment, machinery, and materials. The electrical engineering and instrument making industries must rapidly

establish the capacity to produce high-voltage and transformer equipment, monitoring-distributing devices, and consumption meters. The scientific and technical potential must be set up to produce electrical equipment based on superconductivity, machines and equipment for thermonuclear power plants, oil field and drilling equipment for the oil and gas industry, and powerful and reliable equipment for underground and surface operations in the coal industry, as well as for solar and non-traditional types of energy. All this is directly derived from the decisions of the 27th CPSU Congress to develop technical progress in the sectors of industry and especially in machine building.

In the light of all these circumstances, in the 12th Five-Year Plan the rate of increased investment to develop plants providing effective methods of producing and processing fuel will be considerably higher than for the direct production and transport of energy resources. It is very important that the client and contractor ministries ensure the priority implementation of the tasks of adding the capacities that are of greatest importance to the national economy.

Structure plays a large role in improving the national economic effectiveness of the fuel-energy complex, i.e., what kinds of primary energy resources, how many, and where to produce and process them. The levels indicated in the current five-year plan for the extraction (or production) and processing of primary energy resources on the whole ensure progress in the structure of the country's fuel-energy balance. In particular, there should be a substantial national economic effect as a result of increasing natural gas's share in the total volume of primary energy resources from 34 to 38 percent, since its production cost and labor requirements are considerably lower and its effectiveness to consumers is higher in relation to other types of fuel. For example, as a temporary measure it can be utilized as a substitute for boiler fuel in electric power engineering.

In the total amount of coal produced the ratio of that mined by the efficient open pit method has grown (from 42 percent to 46 percent). Production costs per ton of coal are lower on the average by this method than in mines by a factor of 4.7, capital-output ratio is higher by a factor of 4, and labor productivity is higher by a factor of 10. Unit investment for the construction of open pits is considerably less in comparison to coal mines. The decisive role in the further development of open pit mining belongs to the Kansk-Achinsk Coal Basin, which is the foundation for the world's largest fuel-energy complex (KATEK). However, for various reasons of a scientific, technical, economic, and organizational nature, the work of setting it up is still dragging on, and therefore the potential economic effect from its exploitation has been put off still further in the future. This is chiefly a matter for the USSR Ministry of Power and Electrification, the Ministry of Power Machine Building, the Ministry of Transport Construction, and the USSR Ministry of the Coal Industry.

Advances have been provided for in the balance of oil products output. It is planned to increase the output of diesel fuel by the end of the five-year plan and to reduce the consumption of petroleum residue as a boiler and furnace fuel by a factor of approximately 1.7 relative to the 1985 level. The ratio

of thermal power plants in the generation of electric power is being reduced from 75.8 percent in 1985 to 66 percent in 1990, and the ratio of nuclear and hydroelectric power plants, with their lower production cost for generating electricity, etc. will increase.

The national economic effect from the utilization of the productive potential of the fuel-energy complex is also defined by how energy resources are used in social production, and what the actual output from them is. In recent years the country has considerably increased efforts to reduce losses and increase the efficiency of consuming fuel-energy resources, and this has yielded positive results. Energy saving measures carried out by the complex, including reduction in norms for energy consumption, improvement in the structure of social production, and increased power generation by GES and AES in 1985 as compared with 1980 have achieved savings in organic fuel on the order of 150 million tons by the standard reckoning, or more than in the 10th Five-Year Plan, by a factor of 1.3.

Given the cost and labor requirements of producing and transporting energy resources at the levels they have reached, and given the great opportunities for savings of fuel and energy, the 12th Five-Year Plan and the remaining period up to the year 2000 must provide still higher levels of energy savings and correspondingly a more rapid reduction in the energy intensiveness of national income. For example, savings in organic fuel in the national economy in 1990, relative to 1985, must amount to 200-230 million tons of standard fuel, or more by a factor of 1.3-1.5 than was achieved in the preceding five-year plan. Reduction of the relative labor intensiveness of national income is planned to be on the order of 7-9 percent, versus 6.2 percent. In the following period (up to 2000) energy savings must be intensified still more, and the energy intensiveness of national income must be reduced by no less than a factor of 1.4.

It must be noted that increasing energy savings at the present stage and for the longer term calls for the development and employment of qualitatively new approaches. The fact is that higher than before levels of savings in energy resources must be achieved under conditions where reserves of them are growing less evident, and therefore concealed factors must be found in the economy for energy savings, and the sectoral, technological, and territorial structure of the economy must be improved in order to substantially reduce its energy intensiveness, while simultaneously ensuring the high pace of the country's economic and social development planned for the future.

In practice this means that in the operating process at all levels of planning and management a broad range of measures must be carried out, such as:

structural improvements in industry by more rapid development of the less energy-intensive sectors;

structural changes within specific sectors and plants (production of steel, rolled products, cement, energy-intensive types of chemicals, fuel and raw materials, etc.) so that their technology will be less intensive in energy and materials;

adoption of scientific and technical achievements aimed at advanced changes in the structure of construction materials and increasing the

efficiency of their utilization, i.e., large-scale replacement of the more energy-intensive types of products (ferrous and non-ferrous metals, steel pipe, and other items) with less energy-intensive ones, and considerable increase in the utilization of recycled raw materials and other materials;

utilization of low-waste and waste-free technology aimed at developing new methods of processing raw materials and other materials, and improvement in organizational structures to ensure the comprehensive and complete utilization of all components of waste products;

further improvement in the territorial structure of the national economy and comprehensive development of the country's main economic regions in order to cut down shipments of fuel and raw materials and implement additional measures to economize on the consumption of them and substantially reduce the energy intensiveness of production in regions that are short of their own resources of fuel -- the European part of the USSR, the Urals, Central Asia, the Trans-Caucasus, and the Far East.

Improving the economic mechanism in the area of producing and utilizing energy resources is of great practical importance for increasing the efficiency of the country's energy potential. This was the aim of the recently adopted decree of the CPSU Central Committee and the USSR Council of Ministers on measures for further improving the management of the sectors of the fuel-energy complex. It provides for the formation of a permanent agency for the fuel-energy complex under the Bureau of the USSR Council of Ministers. It is assigned such tasks as increasing the production of fuel, electric power, and thermal energy by extensive adoption of advances in scientific and technical progress, achieving comprehensive utilization of fuel-energy resources, pursuing a unified energy saving program, developing new advanced types of specialized transportation, and further expansion of cooperation in these areas by CEMA member countries.

Within the scope of its authority the Bureau will adopt decisions issued in the form of regulations of the USSR Council of Ministers. This will facilitate a substantial increase in the operating efficiency of the complex's sectors, and efficiency in solving the problems they face in fully meeting the requirements of the national economy for fuel and energy.

In conformity with the decisions of the 27th Party Congress, measures are now being actively worked out to increase the level of economic independence and the incentives of the main units of production -- enterprises and associations -- to accelerate the adoption of advances in scientific and technical progress and the more rational utilization of fixed capital, fuel and energy, and other resources. One of the main reserves here is intensification of the economy, which so far has not been adequately exploited. There is an example of this in the USSR Ministry of Power and Electrification, which in 1985 developed and adopted new methods for the planning and economic stimulation of electric power generation. The economic norms for establishing material incentive funds were made directly dependent on the level of utilization of established capacities. These economic levers made it possible by the end of the year for the operations of power plants to generate more than 10 million kW of additional power, which equals the average annual power capacities due to new construction. As already noted, as a result of the measures adopted, power

systems were operating reliably at the standard frequency in the winter months for the first time since 1970.

Considering that the fuel-energy complex is itself a major consumer of fuel-energy resources, one of the most important tasks of the sector's operations is to sharply reduce consumption of them for its own needs, as well as losses of them during production, transportation, and processing, which will also improve the operating efficiency of the complex's sectors.

Without dwelling on other problems of improving the operation of the fuel-energy complex and its active energy-saving program, mention should be made of its highly important role in solving key problems of the country's economic and social development. This means primarily further increasing the level of the mechanization and automation of production, which calls for radical transformation of work places, and making the labor of workers, kolkhozniks, and intellectuals more productive, creative, and attractive. This is one of our main social tasks. The level of automation in the national economy will on the average double in the 12th Five-Year Plan. It is planned to adopt about 5,000 automated systems to control technological processes.

The development of electric power plants is directly linked to so important an approach to scientific and technical progress as the broad development of advanced technologies (the production of electro-steel, the development of non-ferrous metallurgy and electro-chemicals, etc.). It is planned to expand the employment of advanced base technologies in every sector by a factor of 1.5-2 in the current five-year plan.

The increase in the productivity of social labor by a factor of 2.3-2.5, which is planned for the year 2000, must be accompanied by a further intense reduction in manual labor within the national economy. The country now has about 50 million persons engaged in manual labor. The Comprehensive Target Program to Reduce Manual Labor in the Sectors of the USSR's National Economy, which was developed in recent years, provides for freeing up 13-15 million workers. The predominant role here is allotted to technical progress and to supplying labor with electricity and energy, which depends substantially on successful operation of the sectors of the fuel-energy complex.

All this, including supplying fuel-energy resources to fraternal socialist countries and maintaining the required level of hard currency, will, in the final analysis, determine its highly important role in solving the problems of intensifying our economy.

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